Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 63 NEW YORK, SATURDAY, JUNE 13, 1914 No. 24

Development of Foreign Trade

That we need governmental assistance in the development of foreign trade is the substantial argument of the paper read by Mr. Oudin before the first national foreign trade convention, held in Washington last week. The abstract of the paper by Mr. Oudin, published in our issue of June 6, pointed out the fact that friendly intercourse and commercial treaties with over-sea countries, maintained through co-operation of the government, constitute the main door to foreign trade. Legislative and administrative branches of our government can do a large work for manufacturers and the country generally if they will be guided by right commercial principles. The administrative branch of the government can do more than it has done in the past if Congress provides it with necessary funds for commercial representatives abroad. Even without more funds, however, administrative officials can accomplish more than they have done in the recent past by retaining efficient representatives abroad and refusing to turn out trained men so as to give the spoils of office to newcomers. The legislative branch of the government can do much by distinguishing in trust regulation laws between interstate and foreign commerce. It should destroy all restrictions preventing agreement among manufacturers on foreign trade. In doing business with foreign countries our manufacturers have to meet combinations of European manufacturers that are authorized by law. No matter what this government does to prevent combinations in interstate trade, it should not prevent combinations with respect to foreign trade. The lawmakers should see that the laws promote foreign trade.

Street Lighting by Special Assessment

Private street-lighting systems are maintained in large number in American cities. Generally they are installed by merchants on business streets as an advertising attraction, although this is by no means universally the case. Use is almost always made of incandescent lamps supported singly or in clusters on posts of medium height placed at or very near the curb line. Usually the electrical energy and the maintenance service are supplied by an electric-service company. Sometimes an association represents allied property owners, and sometimes the individuals deal directly with the company. This method of lighting for special or advertising purposes has been unquestionably of great value to the community affected by the general street illumination. However, the success of the plan depends on co-operation among a group of business men, and this concerted action must be practically unanimous; otherwise there will be irregularity in the spacing of the lamps with frequent comparatively dark spots. Under these circumstances it is argued that, taking a leaf out of the book of these group-lighting installations and carrying the idea a step farther, commercial street lighting should be supplied under a special-assessment system and paid for by the owners of the abutting property. There seems to be no objection to this proposal which cannot be urged with equal force against the building and maintenance of pavements or sidewalks. The special illumination gives added value to every foot of property within the area lighted. The system proposed would seem to be equitable and permanent. It is probable that under a properly worked-out special-assessment system depreciation on equipment other than the lamps and accessories would not be more than 4 per cent. The city can borrow money at a rate not greatly in excess of 4 per cent. Under a special assessment system the ample lighting of the entire street would be the object sought. Energy for the regular city or police lighting and the special lighting might be supplied from the same system, and they would supplement each other.

Attack on a Public Utility Commission

Sometimes the best answer to a vicious attack is silence. In other cases an answer is wise. One of these cases is the attack of the Minnesota Home Rule League on the regulation of public utilities by the Railroad Commission of Wisconsin. This league has published a book which purports to give "an analysis of the system and the results." It really reviews certain cases with the idea of making the efficient and fair-minded Wisconsin commission seem hostile to the public interest. The underlying motive of the booklet appears to be to promote municipal ownership. The league is opposed to public regulation because it believes that regulation prevents public ownership. Between the attitude of the Wisconsin commission and the attitude of the Minnesota Home Rule League there can be no union. Their positions conflict. The policy of the one is not reconcilable with the policy of the other. The Minnesota league would evidently have, if it could, entire freedom of action on the part of a city to deal with its utility. It would permit the city to distress and force the utility to the point at which the court would intervene on the ground of confiscation. It regards the control of utility securities as the concern of investors

alone, and not of the general public. It criticises the Wisconsin commission for raising rates in some cases. Would it be so unfair as to refuse an increase in rates if revenues are inadequate?

The league finds fault because the commission is not abjectly in favor of the thing for which the league stands. Why the Wisconsin commission cannot promote home rule ought to be tolerably clear. It was created to take from the cities a power of home rule which the cities had abused and to set up instead a state power to decide the issues between company and city. It cannot harass utilities without regard to the rights of the company because the law was not created to provide a body to be a mere agent for distressing the company. If the commission is true to the law under which it was created and to the judgment of the public represented in that law, it must decide without bias for either side the issues before it. If there is a redeeming clause in the booklet, it is the grudging admission that "nothing but the integrity and high personnel of the commission saved it from being open to the suspicion of direct collusion" with one company. But the booklet does not carry through its forty-six pages, as it should, the evident conviction of its writers as to the "integrity and high personnel" of the commission. Because it so grossly misrepresents the attitude and work of the commission the campaign and erroneous statements of the league should not be allowed to go unanswered.

Progress in Radiotelegraphy

A large part of a paper by Mr. H. Diesselhorst on recent radiotelegraphic progress, read before the annual convention of the Verband Deutscher Elektrotechniker, in Magdeburg, deals with methods for generating continuous oscillations at the sending station. These consist broadly of arc methods, alternator methods and transformer methods. The arc methods aim to set up continuous oscillations in a secondary circuit from pulsatory currents in a primary circuit containing the arc. They have the advantage that the electron streams in the arc have immense mobility, or extremely small inertia, and hence are able to respond to impulses of very high frequency. Their difficulties lie in the way of controlling sufficient power for long-distance radiotelegraphy.

The alternator methods include the method of direct high-frequency generation developed by Fessenden and Alexanderson in this country, and also the method of mixed generation and frequency raising developed by Goldschmidt in Europe. These methods have the advantage of definitely impressing continuous forced oscillations on the sending antenna. Their difficulties are found in increasing their power, since enlarging the machines means increasing their mechanical and electrical stresses in rapid proportion. The step-up frequency transformer methods depend upon nursing some harmonic frequency into prominence. This may also be done in conjunction with specially designed freak-harmonic alternators. This is the most recent direction of experimental advance and seems to be very promising. Sooner or later, it is to be hoped that machinery can be built for the generation of hundreds of kilowatts at a frequency near to 100,000 cycles per second.

It is suggested that reflection of waves from a high-level discontinuity layer in the atmosphere may be capable of producing interference phenomena whereby the intensity of received signals may alternately wax and wane as the waves expand. By noting, at a given range, the wave-lengths of maximum and minimum received intensity, the height of the reflecting layer may be estimated. In a particular case this height is worked out to be about 100 km. An acoustic analogue to the electrical reflection phenomenon is discussed. Indications are given of an acoustic reflection produced by a discontinuity layer of atmosphere about 70 km high, and it is stated that the sound-wave due to an explosion of dynamite at the Jungfrau station in the Alps in November, 1908, was found to be reinforced in this way. At least, it has been claimed that the distance at which the explosion was heard could only be accounted for in such a manner.

The Salmon River Power Plant

It is a pleasure to record the story of the new hydroelectric plant established through the development of the resources of the Salmon River, which flows westward from the Adirondacks into Lake Ontario. The stream is interesting in that it drains a basin of exceptionally large rainfall. The hydraulic engineer, in investigating the possibilities of the country, finds some curious variations in the condition of rainfall and run-off. It is well known that the rainfall is markedly different in different parts of the country, but it is a less familiar fact that within comparatively short distances the rainfall may change in a very conspicuous degree. For instance, in the Salmon River drainage basin the fall rises to 60 in. annually, nearly 50 per cent greater than the ordinary fall in New England. The result of this situation is that the Salmon River is exceptionally good for hydroelectric development.

A concrete dam across the river valley backs up the water for some eight miles with a storage capacity of over 2,500,000,000 cu. ft. The site for the power house is about two miles down stream, where the available head is 245 ft., exceptionally high for this part of the country. The gates at the dam, by the way, are operated by a 25-hp Pelton wheel, which is somewhat out of the usual line of practice. The conduit for the water begins with a 600-ft. tunnel through a ridge and then continues for a little more than a mile and a half with wood-stave pipe 12 ft. in diameter having staves nearly 4 in. thick. Next comes 1200 ft. of steel pipe 11.5 ft. in diameter and $\frac{5}{8}$ in. thick. This pipe, which is housed over and protected against freezing, leads down to the head-works for the penstocks, which are perhaps the most interesting feature of the plant, consisting of a transverse distributing pipe more than 200 ft. long

and a gigantic surge tank 50 ft. in diameter and 80 ft. high, with a hemispherical bottom adding 25 ft. more to the height. The whole is mounted on columns until the roof is over 200 ft. above the ground, so that it tops the crest of the dam above. A 12-ft. riser connects the distributing pipe with the surge tank through a special arrangement of ports which adds friction enough to damp the surging.

From the distributer to the power house the water is carried in four 8-ft. penstocks, each equipped with a very ingenious motor-driven gate mechanism operated from the station. Each penstock leads to a 10,000-hp horizontal turbine equipped with a heavy flywheel and driving a 5600-kva generator at 375 r.p.m. The generators are 6600-volt, three-phase machines designed for twenty-five cycles, inasmuch as the plant is to feed energy into the Niagara system at Solvay about 42 miles distant. The electrical equipment is somewhat conventional except that a very ingenious system of voltage regulation, fully described in the article, is in use. The transmission line itself, which is operated at 60,000 volts, is carried on rigid square steel towers, 44 ft. in height to the lowest insulator. There are two circuits, each of stranded hard-drawn copper No. 4-0 equivalent. The whole system has been designed with special reference to working in parallel with the Niagara system as part of the general equipment of the Niagara, Lockport & Ontario Power Company. This use made necessary special attention to regulation, which gives to the new plant a claim much stronger than usual to detailed study.

The London Electrical Supply Situation

Elsewhere in this issue there is presented a most instructive review of the London electrical supply problem by Mr. Haydn Harrison, who has made a careful study of electrical affairs in the metropolis for many years past. The situation in London is indeed a curious one, owing, perhaps, to what from the American point of view is the singular constitution of London from the standpoint of civic affairs. The world's metropolis is an agglomeration of municipalities with many local rights rigorously preserved yet with a general unity for certain administrative purposes. In each of the varied districts electrical supply has grown up according to local conditions, sometimes under the ownership of the municipality, sometimes as a private enterprise of the sort familiar here. In whichever way the enterprise has developed it has found itself rigorously limited in extent by the confines of the particular quasi-independent municipality in which it has more or less flourished. The situation is something as if Chicago were to be served by completely independent plants, each working in a single ward, part operated by the local authorities and part by private enterprise. The parallel would be perhaps nearer if one reckoned a separate plant for every voting precinct, for there are about seventy generating stations in the London territory, all save a very few being totally independent of any of the others.

In the sixty-five separate undertakings considered by Mr. Harrison use is made of thirty-one different systems of generating current, twenty-one distributing voltages, eight different frequencies, and, further to confound the situation, there are fifty methods of charging for the output. The municipal plants in the group are naturally jealously guarded, for political reasons, and privately owned systems are expending the minimum amount in improvements for the simple reason that under the acts of Parliament the London County Council has the right to purchase, if it so desires, in 1931. As a matter of fact, some of the private and municipal enterprises, even those operating over a territory of only two or three square miles, are well administered and profitable, and supply electricity at very moderate rates. Nevertheless, on the whole, the situation is fatal to economy, and several attempts toward unification have been made. The most notable of these is the one now in hand for which Messrs. Merz and McLellan have just made a report to the London County Council. This report has already been somewhat discussed in our columns. The fundamental purpose of the present project is to furnish from a single generating station energy in bulk to the various undertakings, and eventually to unify the system of supply so as to improve not only the generating but the distributing conditions. Mr. Harrison indicates that such a plant might have an output rating of 500,000 kw in perhaps ten generating sets, and would be situated far enough down the river from London to get the fullest advantage of the waterfront in the delivery of coal. That there is ample margin for the success of such an undertaking is shown by the statement that on the average the working expense per kilowatt-hour in London is 2.2 cents.

The total rating of the existing stations is 307,000 kw, but inasmuch as the sales per head of population amount to only 48.5 kw-hr. annually, it is very evident that nearly double the equipment rating just noted would be required for a development of electrical service comparable to that of New York or Chicago. On such a scale the operating costs in the generating station would obviously be very low, especially since under London conditions an unusually high diversity-factor is to be expected. It therefore should be possible to operate such a plant at an extraordinarily high load-factor with a corresponding economy. As to the methods of carrying out this proposal, Mr. Harrison is of the opinion that the suggestion made in the report of general municipal ownership of the larger project, the details of operation being left in the hands of private authorities, may lead to something practicable. At all events, the time is ripe for radical improvement, and some way should be found of bringing the various public and private undertakings together to obtain the advantages of a bulk supply generated at a far lower cost than is now possible even in the most economical of the existing stations.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

Decision in St. Mary's River Case

The international joint commission in the case of the Michigan Northern Power Company and the Algoma Steel Corporation announced its decision at Ottawa on June 4. The companies, which have large power plants on the St. Mary's River at Sault Ste. Marie, will be allowed to use a much larger quantity of water and will therefore enlarge their developments materially. The companies will be allowed to divert 30,000 cu. ft. of water per second from the river, and the total development will be over 100,000 hp. The judgment of the commission indicates that the commission and the two governments recognized that the water of this and all other boundary streams is to be conserved primarily for navigation and only incidentally for the development of energy.

Electricity in Motion-Picture Exhibit

At the second annual motion-picture exposition held at the Grand Central Palace, New York, June 8 to 13, one of the most interesting features was the studio erected especially for producing motion-picture acts. The films were developed soon after the plays were rehearsed and then the pictures were shown in small theaters provided for the purpose. The lighting equipment for this studio consisted of 104 mercury-vapor lamps and two so-called "targon" filament lamps made by the Cooper Hewitt Electric Company. Another noteworthy exhibit was that of the United Electric Light & Power Company. An electrically lighted model of the 201st Street station was shown with the coal-handling equipment kept continually in operation. Miniature trains were made to pass by the plant. Several electrically operated motion-picture machines and miscellaneous electric appliances were also shown in this booth. Various types of arc lamps for exterior lighting were on display in a booth maintained by the Koerting & Mathieson Company. Different kinds of electrically operated motion-picture machines were also exhibited by various manufacturers.

Early Patent Legislation Not Probable

According to statements made at the office of Representative Oldfield, chairman of the patent committee of the House of Representatives, there is little likelihood of any legislation in regard to patent matters at this session of Congress. The calendars are jammed full of bills, and it is the intention of leaders in Congress to permit no legislation not on the program.

Hearings which have been in progress for the past month before the committee on the bill providing for the registration of designs have been completed for the present, although it is announced that they may be resumed later.

The committee is still hearing those who desire to speak on the general bill, known as the Oldfield bill, providing for the revision and codification of the patent statutes. Mr. William H. Ingersoll testified on June 10 in regard to his views on the maintenance of resale prices. Attorney Edmunds, counsel for the A. B. Dick Company, who carried the "mimeograph" case through the Supreme Court, appeared before the committee on June 13 to speak on the maintenance of resale prices, and also on the binding clause of contracts under which manufacturers of patented articles can require persons to use their accessories.

No hearings are scheduled for next week. It is stated at Mr. Oldfield's office that no one connected with the electrical industry has asked to be heard on any of the various features of the two bills, although the committee would be glad to hear any one so connected who may desire to be heard.

Representative Metz, of Brooklyn, N. Y., has introduced a bill providing that patent rights shall continue only nineteen years after being granted.

Strike at Westinghouse Plant

A number of the employees of the Westinghouse Electric & Manufacturing Company and the Westinghouse Machine Company went out on a strike on June 5. The strike was declared primarily on account of the refusal of the management to recognize the demands of the Allegheny Congenial Industrial Union, a newly formed labor organization. The plants of the companies at East Pittsburgh are partly shut down as the result of the strike.

The following official statement in regard to the situation was issued on June 5 after the men went out on strike:

"A part of the working forces of the Westinghouse Electric & Manufacturing Company, the Westinghouse Machine Company and the Pittsburgh Motor Company failed to report for duty this morning. The officers of these companies state that owing to the falling off of business, which began to affect them last November, it was necessary to make a reduction either in the working forces or in the working hours, and in order to give employement to as many as possible the working hours were shortened from fifty-four to forty-five hours a week.

"Since a large proportion of the workers are not in a position to realize how serious this falling off of orders has been, some dissatisfaction has arisen. The company has even provided additional work for the men by making up a large stock of various classes of standard apparatus, which is at present on hand."

It is the belief of the management that the trouble will not last long.

The trouble began on the afternoon of June 4, when a committee of employees of the Westinghouse Electric & Manufacturing Company called on Mr. H. P. Davis, vice-president, and presented a petition. The committee asked that the company reinstate men laid off and discharged since Feb. 1, 1914, in place of hiring new men, eliminate all bonus systems, premium systems and piece-work systems, and arrange during

slack business seasons to alternate the lay-offs for a short period only and to reinstate all employees whose temporary lay-offs would not hamper or interfere in the proper operation of the plant.

Mr. Davis, after reading the petition, asked the members of the committee whom they represented. He was informed that they were employees belonging to Local No. 1 of the Allegheny Congenial Industrial Union. He told them he could not deal with their organization but would consider their request as employees of the company. After about an hour of discussion the members of the committee were told that their petition could not be granted.

On the following morning without further notice, and, it is stated, with no reference of the matter to the whole body of workmen or to the membership of the so-called union, the strike was called by circulars handed to the men as they came to work. Only a small number of persons responded to this call. However, the location of the works made it easy to start processions and men with banners and horns marched by the shop windows. This, together with the opportunities for conference at the noon hour, led a large portion of the men to go out before the day was over. The next morning when the whistle blew the streets surrounding the works were packed with a crowd of strikers, largely of the foreign element and the younger men. These strikers with threats and violence succeeded in driving off nearly all employees who tried to enter the works, except those who were needed for the protection of the shops from fire and violence.

The company has made no effort to push the resumption of operations, although the gates have been open every day as usual and several hundred employees have succeeding in entering and attending to work. It is believed that a very large proportion of the men will return to work as soon as the turbulence on the streets adjacent to the works has been quelled and they feel it safe to do so. The public authorities by the exercise of skill and forbearance have succeeded in avoiding serious rioting and are rapidly gaining complete control of the situation.

Public Ownership Movement in District of Columbia

The committee on the District of Columbia of the House of Representatives voted on June 6 to report favorably to the House the Crosser bill providing for public ownership and operation of the electric railways in the District of Columbia. The vote in the committee is said to have been nine to eight.

During the hearings on this bill before the committee Mr. F. C. Henderschott, manager of the bureau of education of the New York Edison Company, appeared as a witness on behalf of the National Electric Light Association to protest against the passage of the measure. Mr. W. D. Kerr, director of the Bureau of Public Service Economics, also appeared as a witness. A number of witnesses appeared on behalf of the American Electric Railway Association.

The report of the public policy committee of the National Electric Light Association, presented at the convention in Philadelphia last week, condemned the proposal for public ownership of the electric railways in the District of Columbia. The committee characterized the movement in Washington as one of the most serious of recent developments toward government ownership and operation. It is understood that this is but the first step toward the acquirement of all the public utilities of the city of Washington and the District of Columbia and their future operation as well as ownership by the national government. The movement is one of the most serious political and economic import. Obviously, it would be no more possible for private capital and employment to compete with the unlimited resources of the national government in transportation or the manufacture and sale of gas or electricity than it would be for private effort to compete with the resources of the government in the manufacture and sale of clothing or of food or any of life's necessities, the availability of which is a matter of far greater human importance. The principle underlying the one underlies all, and the committee expresses the hope that upon proper consideration of the matter Congress will defeat this movement. The committee urges members to get in touch with their representatives in Congress and present to them the serious political and economic consequences that are bound to follow an undertaking of this nature.

Illuminating Engineering Society Officers Elected

The report of the committee of tellers of the Illuminating Engineering Society on the results of the recent annual election, presented to the council of the society June 11, showed that the following national officers had been elected for the ensuing year:

President, Dr. A. S. McAllister; vice-presidents for two years, Messrs. F. A. Vaughn and C. A. B. Halvorson, Jr.; general secretary, Mr. Joseph D. Israel; treasurer, Mr. L. B. Marks; directors for three years, Messrs. Ellice M. Alger, Harold Calvert and V. R. Lansingh.

Chicago Section: Chairman, Mr. W. A. Durgin; secretary, Mr. H. B. Wheeler; managers, Messrs. Harry S. Gradle, M. G. Lloyd, F. A. Pinckney, Edward G. Pratt and Herman V. Willman.

New York Section: Chairman, Mr. Norman Macbeth; secretary, Mr. Clarence L. Law; managers, Messrs. George W. Cassidy, Norman D. Macdonald, H. B. McLean, Frank E. Wallis and Percy S. Young.

New England Section: Chairman, Dr. Louis Bell; secretary, Mr. S. C. Rogers; manager, Messrs. C. M. Coles, J. W. Cowles, Walter B. Lancaster, H. F. Wallace and R. C. Ware.

Pittsburgh Section: Chairman, Mr. G. W. Roosa; secretary, Mr. S. G. Hibben; managers, Messrs. W. A. Donkin, H. S. Hower, Harold Kirschberg, E. B. Rowe and R. H. Skinner.

Philadelphia Section: Chairman, Mr. H. A. Hornor; secretary, Mr. L. B. Eichengreen; managers, Messrs. James Barnes, Douglass Burnett, George S. Crampton, R. B. Ely and F. H. Gilpin.

Dr. A. S. McAllister, the newly elected president of the society, is editor of the *Electrical World*.

Congressional Action Likely on General Dam Amendments

Representative Adamson, chairman of the House committee on interstate and foreign commerce, has succeeded in getting his bill which proposes to amend the general dam act into a privileged position on the calendar of the House, and announces his expectation that it will be passed at the present session of Congress.

Nothing remains to be done in regard to the bill, so far as its legislative status is concerned. The subject of amending the dam act, as well as of conservation, will be the next one to be considered on the floor of the House, following the passage of the usual appropriation bills for the expenses of the government. Mr.

Adamson informs the *Electrical World* that as soon as the appropriation bills are out of the way he will call up his bill. Owing to the privileged position he has obtained for it, it must come up.

It is stated in Washington that as soon as this bill is called up the general subject of water-powers, hydro-electric plants, conservation and correlated subjects will be taken up in general debate on the floor of the House. Representative Adamson's bill is the result of conferences and agreements with the Secretary of War, and it represents the views of the administration as to what should be done in regard to the matters it covers, as arrived at by President Wilson and his Cabinet.

Trust Legislation in the Senate

The United States Senate is about to engage in consideration of anti-trust legislation which is expected to continue for two months.

The certainty of this legislation became known when the Senate committee on interstate commerce decided on June 6 to report favorably the Newlands federal trade commission bill. The father of that measure announced that he intended to have it made the unfinished business of the Senate following the passage of the canal tolls bill. The "unfinished business" of the Senate means that a bill so declared is brought up every day until acted upon, and in the case of this bill it is also further announced that it is open to amendments of any sort. There is little question that many will be offered. The bill does not go into the subjects of interlocking directorates, holding companies or railway capitalization, but amendments dealing with these questions can be proposed and must be voted upon.

The House of Representatives on the night of June 5 passed three anti-trust bills—the Clayton omnibus anti-trust measure, the House judiciary committee substitute for the Rayburn railway capitalization bill and Representative Covington's interstate trade commission bill. Action on these bills in the House came rather unexpectedly. The result showed the actual position of Republicans in the House. Only one Democrat voted against the Clayton bill, Representative White, of Ohio. Forty-three Republicans and sixteen Progressives voted for the Clayton bill with the Democrats.

The Clayton bill, which has been informally approved by President Wilson, was referred to the Senate judiciary committee, where the committee will certainly have it under consideration for at least several weeks. The other two bills also went to committee.

Any of the provisions in the three bills passed by the House may be tacked on to the "Newlands substitute," ordered favorably reported from the Senate interstate commerce committee. Senator Newlands will lead the fight in the Senate for the passage of the anti-trust legislation. He will be opposed in leadership by Senator Brandegee, of Connecticut, who, with a number of other senators on both sides of the Chamber, is opposed to any anti-trust legislation during the remainder of this session of Congress.

The "Newlands substitute," now known as the "federal trade commission bill," provides for a commission of five, not more than three of whom shall be of the same political party, to be appointed by the President, each to have a salary of $10,000 a year. The bill authorizes the commission to investigate from time to time the organization, business, financial condition, conduct, practices and management of any corporation engaged in interstate commerce, and its relations to other corporations, associations and individuals.

Senator Brandegee, in a statement made in Washington in regard to the measure, said in part: "In view of the widespread business depression and the apprehension which prevails in commercial and financial centers, I regard the projection of these questions concerning the further inspection and regulation of business by the federal government at this time as a grave mistake."

With reference to the three bills passed by the House of Representatives, Representative Mann, of Illinois, issued a statement in Washington in which he said in part: "There is nothing in any of the Democratic anti-trust bills that will build a fire that is now out, start a factory or in any way encourage business.

"These measures are repressive. There was a demand for legislation supplementary to the anti-trust law that would permit business to be conducted without uncertainty as to its rights. The Clayton bill adds to and does not remove any of the uncertainty that now exists. If enacted into law, it will do a great deal of harm. The interstate trade commission bill represents an evolution in the plan evolved in the office of the commissioner of corporations. It may serve a useful purpose by bringing business and the government into closer relationship. The Clayton bill is dangerous. No one can do business under that bill without having the penitentiary face him all the time. Every business transaction will be left liable to a criminal charge."

Mr. Insull on Illinois Commission and Welfare Work

In his annual report as president of the Public Service Company of Northern Illinois Mr. Samuel Insull refers to the new Public Utilities Commission of Illinois. He also describes at length welfare work for employees in which the company has engaged. Mr. Insull says that the new Illinois commission law "will doubtless cause some operating inconvenience for a time, but no serious difficulties are anticipated, and the ultimate result should be beneficial both to the public and to the company. The company's service is rendered in fourteen counties and in 144 municipalities, with varying ordinance requirements, and eventually regulation by one body must naturally tend toward a larger degree of uniformity."

A service annuity system to make provision for faithful employees was put into effect on Dec. 1, 1913. It is administered by a committee of five composed of the president of the company as chairman, the secretary of the company as secretary, ex officio, and three other members to be appointed annually by the board of directors. These three for the first year are Messrs. Frank J. Baker, vice-president; Charles A. Munroe, vice-president, and George H. Lukes, general superintendent.

Upon his request, if approved by the committee, any employee of fifty-five years of age and thirty years of service shall be retired with an annuity. Upon his request, if approved by the committee, any employee of sixty years of age and twenty years of service shall be retired with an annuity. Any employee of sixty-five years of age and fifteen years of service shall be retired with an annuity unless for a special reason the directors shall continue any such employee in active service without an annuity.

The amount of the annuity proposed to be paid each year to a retired employee is 1½ per cent of the average annual pay of the employee during the particular five consecutive years of service when the average pay was the highest, multiplied by the number of years of service, the annuity in no case to be less than $300.

The company also established about Dec. 1, 1913, an

employees' savings fund for the twofold purpose of encouraging thrift on the part of the employees and of facilitating their acquisition of stock in the company. Any employee of the company who has been in the service of the company for one year or longer may become a subscriber. Each subscriber is required to pay into the fund during his subscription period 3 per cent or 5 per cent of his salary, as he may elect, such payment to be made semi-monthly. A committee, consisting of Messrs. Samuel Insull, Edward P. Russell, Frank G. Logan, Frank J. Baker, Charles A. Munroe, William A. Fox and George H. Lukes, was appointed by the directors to take charge of the fund as trustees. The board has sold to the employees' savings fund committee and turned over to its members as trustees $1,000,000 of the company's common capital stock, to be paid for from time to time under the terms of a written agreement as the savings of employees shall accrue.

Underground-Conduit Developments in Montreal

Substantial progress is being made in conduit construction in Montreal under the supervision of the Montreal Electric Commission, which was organized by an act of the Quebec Legislature of 1909 for the purpose of removing all overhead wires in the city with the exception of trolley contact wires. The commission consists of Dr. L. A. Herdt, of McGill University, chairman; Mr. R. S. Kelsch, representing the various public utility companies in the city, and Mr. de Gaspé Beaubien, representing the Quebec Public Utilities Commission, all being consulting engineers charged with the broad supervision of the problem of underground-conduit construction, the operation and maintenance of such structures, and the taking over of existing overhead lines and conduits in the establishment of a comprehensive system. The work being done at Montreal is one of the first instances where a municipality of 500,000 inhabitants has embarked upon a program of such scope upon the basis of a legislative act, and it is of particular interest in relation to the engineering and operating problems involved.

The members of the commission were appointed in 1911, and the first meeting of the board was held in the fall of that year. Additional powers necessary to give the commission complete control of the wire situation in the city were obtained from the Legislature in 1912, and the latter part of that year was occupied in engineering work involving studies of underground-conduit problems in Montreal and elsewhere and the preparation of plans, specifications and contracts for the initial installation. Construction was begun in the spring of 1913, and at present work is being pushed along the two major axial thoroughfares of the city, St. Catherine and Bleury Streets. About 687,000 ft. of duct have been laid in the former and 180,000 ft. in Bleury Street and Park Avenue. In general the main conduit consists of 3½-in. square tile duct, 3½-in. fiber duct being used in the construction of laterals and services. The district at first to be covered consists roughly of an area about 3.5 miles long and 1 mile wide, including the business center and adjacent residential sections.

The commission will lease its ducts to utility companies upon a duct-feet rental basis not yet announced, and similar systems of transmission and distribution will be placed in adjoining ducts. The rental will be set at a figure which will cover all fixed and operating charges on the conduit system. An initial appropriation of $5,000,000 has been granted the commission, and all plans and specifications are approved by the Public Utilities Commission of Quebec before the award of contracts. The last-named body also acts as a board of arbitration in case of an appeal by any party in interest. Neither the city nor any company has the present right to install overhead wires, the Electrical Commission having sole jurisdiction over all wire and conduit work. It is believed that this arrangement will greatly reduce the burden of street openings experienced in cities of large size in which conduit is installed and maintained by the companies.

Plans are now being prepared in the offices of the board for placing underground wires throughout the entire business district. In general, three types of manholes are to be used—drain manholes, placed at street crossings and intersections; service manholes, usually 250 ft. apart, and containing connections for from two to six service pipes, depending on the demands of the local buildings, and transformer manholes. A maximum of thirty-two ducts per conduit has thus far been installed, and it is expected that cable pulling will begin early in the present month. The Bell Telephone Company of Canada maintains its own system of conduits by a charter provision, but all other utilities, including the local railway, power, telegraph and signaling systems, are to lease appropriate space in the city duct system. Contracts are awarded for various sections of the work upon a purely competitive basis. Occupants of buildings taking service from the companies using the ducts are required by ordinance to have their buildings wired to permit an underground service entrance in each case.

Corporation Industrial and Vocational Schools

The United States Commission on Industrial Relations is holding a series of hearings in New York City. Among those who have given testimony during the last week bearing particularly on the subject of industrial education and vocational schools are Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company, and Mr. Arthur Williams, general inspector of the New York Edison Company.

Testimony of Dr. Steinmetz

Dr. Steinmetz testified on June 1. From his experience as consulting engineer, as university professor and as past-president of the board of education of his home city, Dr. Steinmetz has come to the conclusion that vocational training should not be a part of the school curriculum in the grades of the public schools, but it should begin after the pupil has been graduated from the general education course of the public school.

The general education or instruction in all those subjects which the young citizen of to-day must have, and which is necessary before the pupil can begin to specialize in learning a trade, entering a business or learning a profession, has been given and is still given to-day very satisfactorily by the public-school system of the country. Dr. Steinmetz therefore does not believe that there is any call for a reorganization of the public-school system. The need is for an extension of the public-school system.

The part of the education which follows that of the grade schools consists in the learning of a trade, etc. This part has been taken care of in former times by private interests, in the form of apprentice boys and similar educational methods. By the constant development of modern industry, this apprentice clause, and with it all the chances of this second private education, have been wiped out, and the unsatisfactory situation which confronts society to-day is not a failure of the general education system, but it is the collapse by rea-

son of the corporate industrial development of the special training and preparatory work for trade or profession.

In the opinion of Dr. Steinmetz, here as in all cases where private enterprise fails, it is the duty of the community or society to step in and provide what private enterprise cannot do or has become incompetent to do, that is, provide the means of educational training or the teaching of an industry. The time devoted in the grade schools to general education is altogether too short, and to sacrifice more of this time to teaching a trade or profession would be suicidal. Vocational training and industrial education should not enter into a grade school at the sacrifice of the educational and manual training and domestic science, which are a part of modern general education.

Taking only immediate possibilities, Dr. Steinmetz does not think the feasibility of the idea that society should contribute for sustenance of the pupils should be considered now, but he would allow the pupil at fourteen years of age to accept employment and earn a living or as large a part thereof as possible, provided that the employment is such as to contribute to some extent to education, and provided also that a part of the time is still devoted to education. In other words, he would make a law providing that the school age extend to the completed eighteenth year of the pupil, but that at fourteen years of age those pupils who can show that they or their parents need the income, who can bring a certificate from the superintendent of schools showing that they have passed a certain definite minimum grade, and who can bring a certificate from the health physician showing that they are physically fit to enter industries, would be free to enter employment, with a limitation that during the week a certain number of hours, say five as a minimum, must be set aside for educational work. The employer must agree also and the employment must be of a kind approved by the school system of the location.

There is one serious difficulty with such a scheme where it is applied to the age from fourteen to sixteen years. These children would not be able to find any employment because the employers would prefer persons above sixteen years free from these limitations. This is the reason why Dr. Steinmetz believes that such a law when applied to the age from fourteen to sixteen would fail, while it would succeed when applied to the age from fourteen to eighteen.

Dr. Steinmetz added that there is a very strong tendency in the larger centers of population to establish trade apprenticeship schools and corporation schools. He is the vice-president of the National Association of Corporation Schools. Many industries are operating corporation schools and apprenticeship courses. Modern corporate industries are based on extensive division of labor, and in an apprentice course, which of necessity must combine various classes of labor, they have relatively short intervals. Such a course has no place in modern industry and cannot be combined with modern industry, but is inherently of the outside. It is a philanthropic institution, a measure whereby the corporation endeavors to train skilled workmen. There are three different methods by which the training for a trade, business or profession can be accomplished. The first is by the independent vocational schools or industrial schools. The second method in industrial training is the apprenticeship course of the industrial corporation. This is somewhat more efficient economically, but the experience with such apprenticeship schools in his company, said Dr. Steinmetz, is that the wage which can be paid to the apprentice is extremely low—so low that as a rule there is considerable objection, apparently justified, from labor unions and others against working therefor. At the same time the work of the apprentice does not pay, owing to the relatively short time when the apprentice can be kept at the same class of work. The short period which he can use for his acquired skill is not sufficient to pay for the loss in giving him the skill. In these schools the apprentices do a little of all kinds of work, while within the big corporation there is a strict subdivision of labor. That again makes the apprentice school rather inefficient, so that even at the low pay given the apprentice, economically it is not a paying proposition for the corporation. Therefore it is undertaken and can be expected from the corporation only for the purpose of training a larger number of skilled workmen, but not as a part of the regular business. While the old apprenticeship system in the days of small production was productive, the apprentice in early days paid by his work for his keep and whatever he earned, and a great deal of it was profitable then. It is not so any more.

To encourage private corporations to maintain and extend apprenticeship courses some inducement will have to be made to the corporations. Dr. Steinmetz believes the inducement could be offered by recognition of these apprentice courses as continuation schools, in short, by accepting the apprentices as coming within the line of the pupils from fourteen to eighteen years of age, under such supervision as would guard against abuse of this privilege.

The third method of taking care of industrial training is by allowing the pupil between fourteen and eighteen years of age to enter the industry with some limitations. Either five hours a week of schooling would be given by instructors or teachers of the public-school system of the city or, if so desired, the factory or industry combined might provide a teaching staff giving those five hours of instruction. In most places the schools and school organization is the strongest of all public organizations and least affected by politics in its unsatisfactory sense. Dr. Steinmetz expressed himeslf as being in favor of compulsory vocational schools.

Testimony of Mr. Williams

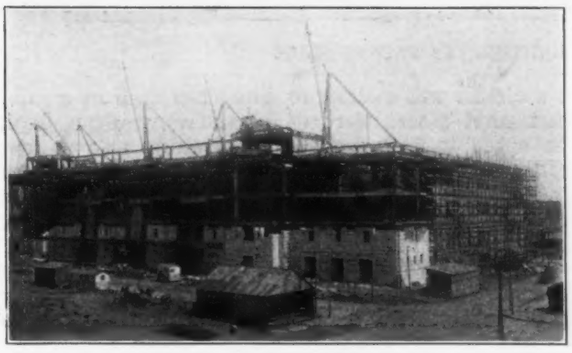
Mr. Williams testified on June 2 as president of the National Association of Corporation Schools. He said that large corporations like the Edison company naturally attract a high grade of men to their service. The company started a school about seven years ago which has been so successful in effecting a personal development of the attending employees that the work has been extended. Education can be given satisfactorily on technical, commercial and accounting lines.

Mr. Williams outlined the scope and purpose of the National Association of Corporation Schools, the membership of which is composed of companies that have schools for employees. The purpose of this association is not to encroach on any educational movement in existence now but to promote education in the ranks of industrial workers. Mr. Williams emphasized the importance of some kind of education for industrial workers. He thinks that the results obtained in the industrial or vocational schools are very much better than those that resulted from the old apprenticeship system. As a good workman is not necessarily a good teacher, a trained teacher should be used.

Mr. Williams believes that the development of schools of this character will lead in time to a new line of activity for teachers. He declared that industrial schools pay handsomely in increased efficiency. Corporations which conduct such schools have to justify the expenditure for them on the ground that they are in the interest of efficiency. However, the employee gets a very much greater benefit than the employer.

Civic Center for San Francisco Conventions

Contrary to the prevailing opinion, most of the large conventions which will go to San Francisco next year will not be held in the grounds of the Panama Pacific International Exposition, but in a civic center in the heart of San Francisco, at the corner of Hayes and Market Streets, right back of the city hall. The exposition authorities gave the city of San Francisco $1,000,000 toward the erection of a permanent civic center which would serve for convention purposes, the city itself providing the site, so that the civic center



CIVIC CENTER IN SAN FRANCISCO

when complete will represent an outlay of approximately $2,000,000. The building is shown in its present state in the accompanying illustration. It will contain a main hall, seating 10,000 people, and nine other halls and committee rooms, seating from 250 to 1200 people, according to the arrangement of the sliding partitions separating the rooms. The building covers a square block and will have six elevators. It is within short walking distance of all of the leading hotels of San Francisco and about ten minutes' ride from the exposition grounds.

New York Electrical Society

At a meeting of the New York Electrical Society on June 10 the following officers were unanimously elected for the year: President, Mr. Frederick A. Scheffler; vice-presidents, Messrs. Bernard Rowntree, George Weiderman, Sr., and O. A. Kenyon; secretary, Mr. George A. Guy; honorary treasurer, Mr. James H. McGraw, and treasurer, Mr. Henry J. Hoeltge.

Following the business session, Mr. William P. Kennedy, consulting transportation engineer, New York, spoke on the topic, "The Electric Vehicle in New York City," and the Electric Vehicle Association's moving-picture film, "Selling an Electric Truck," was shown.

In his address Mr. Kennedy emphasized the sturdy and standardized construction of the electric vehicle, which he characterized as a sort of "dirigible street car," pointing out that, unlike the gasoline car, the component parts of the battery-propelled vehicle are merely slight adaptations of electrical apparatus which has been used in the industrial and railway fields for many years. The speaker prophesied the coming of the cheap electric passenger vehicle, although the "electrics" of to-day, he said, are sold at an average price of $3,000 on account of the luxurious fitting demanded and expensive methods of selling. Passing to commercial trucks Mr. Kennedy cited figures to show that each horse stabled in the city represents a potential electric-truck consumption of 10 kw-hr. to 20 kw-hr. per day for the local central station if electric trucks were used to replace horse-drawn wagons and drays.

Electrical Features of St. Louis Pageant and Masque

Beginning May 28 and continuing until June 1, the outdoor historical theatrical performance known as the "Pageant and Masque of St. Louis," given in the Missouri metropolis, rivaled in magnitude anything of similar character ever attempted in the United States. The production drew an attendance which various authorities estimated at 600,000 to 750,000 persons for the several performances. Approximately 7500 citizens of St. Louis made up the cast. Situated in the pit of an immense natural amphitheater, the 580-ft. by 200-ft. stage was visible from the old World's Fair grounds at Forest Park.

Lighting the Mammoth Stage

Perhaps the best tribute to the successful design of the temporary illumination for this production is found in the remarks of spectators, who frequently observed that they saw nothing unusual electrically. From hidden sources light was concentrated upon the players from foot-lamps, special reflectors and search lanterns. The fore part of the stage was illuminated with 91 amber, 91 red and 187 white 250-watt tungsten foot-lamps, and there were four wing strips of similar white lamps, each containing twelve units. Across the lagoon which bordered the stage in front 197 bank foot-lamps in special reflectors illuminated the water and the bank upon which the stage was built.

From the roof of the Art Museum at the back of the natural amphitheater four 24-in. search-lanterns projected their rays upon the players during the performance and upon the vast crowd during changes of scenery. Of the six 18-in. search-lanterns employed two were situated in a shelter across the lagoon and two in small mounds in front of the stage. There was also one search-lantern in each of the 40-ft. control towers at the ends of the stage. In addition to these large lanterns numerous other 6-in. spot lamps were arranged so that their beams could be used to accentuate the figures of the chief characters.

Features of Electrical Construction

Economy in installation was one of the watchwords in the construction of the electrical equipment. By using seven wooden-barrel-type water rheostats as dim-

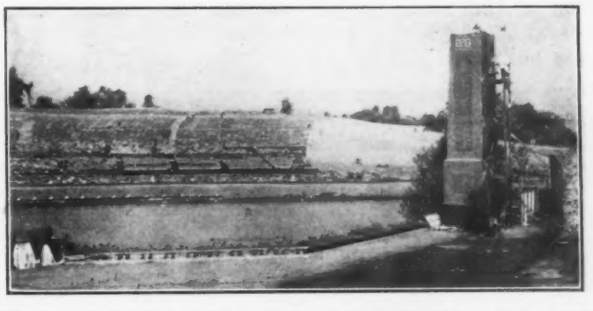


FIG. 1—CONTROL TOWER AND ARRANGEMENT OF LAMPS ON STAGE

mers for the heavy bank of foot-lamps the expense of purchasing large resistors was avoided. The stage electricians manipulating these lamps claimed that the operation of the dimmers was entirely satisfactory, only a slight, but to the audience imperceptible, flash occurring in the lighting when the moving electrode struck the bottom of the barrel.

Energy for the bank foot-lamps across the lagoon was necessarily fed to them by submarine cable, as overhead wiring was undesirable. Although the distance from the switchboard in the tower to the lamps was less than 100 ft., the shortest available piece of

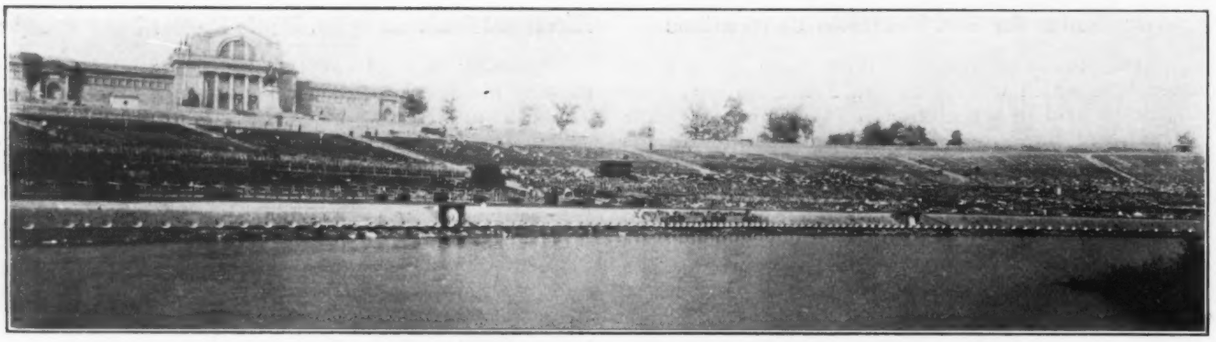


FIG. 2—PORTION OF NATURAL AMPHITHEATER FACING STAGE

250,000-circ. mil cable measured 800 ft. To avoid cutting this cable the extra length was looped back and forth beneath the water of the lagoon out of sight and out of harm's way.

Of the spectacular lighting ideas the Great Bear constellation and the "shooting star" produced the most comment. The "Great Bear," or "dipper," consisted of a large electric sign arranged on a hinge and equipped with a block and tackle so that it could be lowered from the spectators' view except when in use. A flasher produced realistic twinkles in the stars. The "shooting star" necessitated the sacrifice of a 250-watt lamp each night when a husky stage hand hurled the lighted unit from the high back drop. A tungsten-lamp star sliding on a wire was first attempted, but the effect with this was imperfect. The only application of the electric storage battery in the pageant occurred in the illumination of a cross which was carried about the stage by some of the characters.

Telephone Aids to Prompt Operation

Control of the entire lighting installation was centralized in one of the 40-ft. towers. Here a combined alternating-current and direct-current switchboard, laid out with its switches in positions analogous to the apparatus they controlled, was under the watchful eye of the director of electrical effects. With a head-type telephone the director controlled the movements of all electrical operators.

Three telephone circuits leaving the director's position in the tower carried multiple connections to the operators of different groups of lamps. Each operation was numbered so that a key number spoken to anyone on a circuit was audible to all. Thus each of a group knew what others were doing and were about to do. The speed with which these operators, also wearing head-type telephones, responded to the orders of the director was indeed remarkable. The fire and police telegraph department of the city also installed direct telephone communication with the control towers.

Energy for the lighting was supplied entirely from the mains of the Union Electric Light & Power Company through two transformer and motor-generator substations, one, a 255-kw station, being situated behind the stage, and the other, a 50-kw station, being in the Art Museum. In the larger substation behind the stage extra transformer units stood ready in case of breakdown, and one of these, a three-phase unit, had its neutral wire permanently connected with the circuit and the other leads were prepared in sufficient lengths to reach any transformer of the installation. Had trouble occurred these wires with their lugs already soldered in place could have been substituted in about fifteen minutes for those of the transformer which had failed.

Credit for the design of the wiring and illumination of the "Pageant and Masque of St. Louis" is due Mr. A. I. Jacobs, supervisor of city lighting, and his assistant, Mr. Ralph Toensfeldt. The actual construction contract was let to Mr. William A. Corroa and carried out under the direction of his foreman, Mr. H. P. Cherry. The personnel of the committee on lighting and wiring was as follows: Chairman, Mr. A. I. Jacobs; vice-chairman, Mr. Charles J. Sutter; secretary, Mr. George McD. Johnson, and Messrs. Frank Adam, Ell C. Bennett, A. C. Einstein, Charles L. Holman, Arthur Schading and William B. Smith.

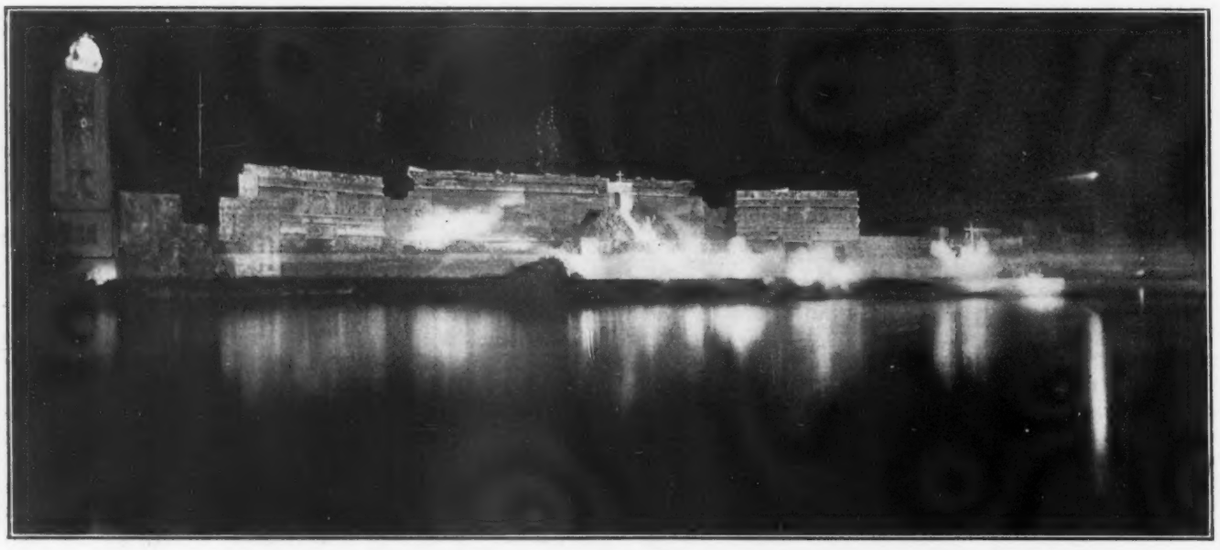


FIG. 3—THE MASQUE—THE GREAT STAGE ILLUMINATED BY NIGHT

Public Service Commission News

Indiana Commission

The Public Service Commission of Indiana is to issue its first annual report soon. An analysis of rates for lighting and motor service will be included. The rates, which were made in the various classes of cities under conditions that existed before the public service commission law became effective, show a wide discrepancy. However, many conditions are to be taken into consideration, members of the commission say, that affect these discrepancies appreciably. Under the commission's classification of cities Class C towns have populations of less than 3000. Necessarily the rates for these towns appear to be high when compared with Class A cities, which have populations of 10,000 and over.

The rates that the report will show in the larger cities are interesting. Indianapolis has now two sets of rates, one put into effect by the Indianapolis Light & Heat Company and the other by the Merchants' Heat & Light Company, which recently took over the People's Light & Heat Company. A complete revision of Indianapolis lighting rates is promised, however, by the commission.

Commission members say they will attempt through the process of regulating each schedule to make the entire State uniform with regard to classes of properties, except where the local conditions of capital invested and property used and useful for the public make uniformity out of the question.

California Commission

The Crescent City Light, Water & Power Company has filed a complaint with the Railroad Commission against George H. Keller and Hobbs, Wall & Company in which it is alleged that Hobbs, Wall & Company are selling electricity to various people in Crescent City contrary to the terms of the public utilities act. It is alleged that the firm of Hobbs, Wall & Company is a lumber concern and not a public utility corporation, but that it has assumed the right since 1905 to sell electricity to the municipality in competition with the Crescent City company.

The Calistoga Electric Company has filed an application with the Railroad Commission asking that an order be made granting it a certificate of public convenience and necessity authorizing it to serve inhabitants and consumers in Napa County north of an east and west line extended through Bale Station, in Napa County. The territory at present is occupied by the Napa Valley Electric Company.

Idaho Commission

During the hearing before the Supreme Court of Idaho in the action of the Idaho Power & Light Company and the Beaver River Power Company against the Public Utilities Commission, which denied to these companies the right to enter territory already served by existing companies, Mr. J. B. Hawley declared that the creation of a commission with power to establish a monopoly is against the welfare of the State; that the Legislature has attempted to delegate to the commission its lawmaking power, and that the commission is a court and unconstitutional because it conflicts with the government divisions into legislative, judicial and executive branches.

It was contended before the court that the Idaho Power & Light Company had secured a franchise at Twin Falls before the commission was created; that the company had done work preparatory to entering Twin Falls before the commission was created, and that a provision in the law excepts power companies from regulation by the commission so far as competition is concerned but not as to regulation of rates. It was also argued that the commission's acts tend to retard the development of the State.

New York Commissions

In connection with the pending valuation of the property of the New York Telephone Company in the State of New York by the Public Service Commission, Second District, a committee has been engaged by the company to make an independent valuation. The members of the committee have been directed to act entirely independent of the company and to be as conservative in their work as if they were acting for a private plant. The committee is as follows: Messrs. F. B. H. Paine, chairman; H. Hobart Porter, Russell Robb, H. P. Gillette, and Gen. George H. Harries. As the committee wanted to have one of the leading officials of the company associated with it, Mr. J. A. Stewart, the general manager, will serve as a member.

New Jersey Commission

The Board of Public Utility Commissioners has dismissed the complaint of Max Taub, Hoboken, against the Public Service Electric Company because of the refusal of the company to furnish him electric service. Such refusal was admitted by the company but was held to be justified by the failure of the complainant to provide for the grounding of secondaries inside his premises, as required by the company's rule. This cost, the complainant held, should be borne by the company. In its decision the board states that the right of the company to adopt rules and regulations in the conduct of its business and require compliance therewith as a condition precedent to furnishing service is undoubted, and, further, that it finds nothing in the case to lead it to change the general rules regarding the grounding of secondaries of transformers put into effect by its orders of Dec. 9, 1913. The board also states that house wiring includes the running of the inside ground wire and that the cost thereof should consequently be defrayed by the consumer.

The board has issued an order suspending an increase in the rates of gas and electricity by the Newton Gas & Electric Company. The board has ordered a public hearing to consider the reasonableness of the proposed increase in rates. The company, which has been in the hands of a receiver since 1910, claims that the increase is essential for proper service and to meet its expenses, and that the year 1913 shows a deficit of $14,000.

The board has granted permission to the Vulcan Electric Light, Heat & Power Company and the Neptunus Water Company to separate stipulated property now held by them jointly.

Ohio Commission

A reorganization of the appraisal department has been announced by the commission. The board will consist of Messrs. L. G. White, electrical engineer, and C. V. Critchfield and George X. Cannon, telephone experts.

New Hampshire Commission

Some changes will be made in the tentative uniform classification of accounts for electric utilities as the result of a hearing held before the Public Service Commission of New Hampshire on May 26. The tentative classification provides for four classes of companies as follows: Class A, companies having average annual operating revenues exceeding $25,000; class B, companies having average annual operating revenues exceeding $10,000 but not more than $25,000; class C, companies having average annual operating revenues exceeding $3,000 but not more than $10,000; class D, companies having average annual operating revenues of $3,000 or less.

Current News Notes

Electrical Show at Memphis, Tenn.—Under the auspices of the local Jovian League an electrical show will be held in the Lowenstein Building, Memphis, Tenn., during the week of June 15.

* * *

Prize Competition, Society for Electrical Development.—The Society for Electrical Development, Inc., is offering eight prizes to employees or members of the society for the best story, article or report on any subject pertaining to commercial electricity. There is one prize of $250, one of $150, one of $50 and five of $10. The competition closes Sept. 1, 1914.

* * *

Honors for Past-Presidents of the A. I. E. E.—Four of the past-presidents of the American Institute of Electrical Engineers have received honorary degrees recently. Mr. C. O. Mailloux, present incumbent, and Mr. L. B. Stillwell, president during 1909-10, received the honorary degree of doctor of science from Lehigh University. Mr. Gano Dunn, president during 1911-12, and Mr. Francis B. Crocker, president during 1897-8, received the honorary degree of master of science from Columbia University on May 29.

* * *

Dinner to German Electrochemists.—Prof. Hans Goldschmidt, of Essen-Ruhr, Germany, president of the German Bunsen Society, and widely known as the inventor of the aluminothermic process and of electrolytic detinning, and Prof. Paul Askenasy, of the Institute of Technology of Karlsruhe, editor of the *Zeitschrift für Elektrochemie*, were the guests of honor at an informal dinner given on June 8 at the Chemists' Club by the New York Section of the American Electrochemical Society. Dr. C. G. Fink, chairman of the section, presided, and speeches were made by Dr. Goldschmidt, Dr. Askenasy, Dr. L. H. Baekeland, Dr. J. W. Richards and Dr. Alexander Smith.

* * *

French Capital Interested in Mexican Power-Plant Option.—Addressing the members and guests of the Chicago Electric Club on June 4, Mr. Robert J. Kerr, civil governor of Vera Cruz pending the arrival of the United States Army, said that during his recent trip from Vera Cruz to Havana he had spoken with a French capitalist who had been investigating an option on the Necaxa power plant of the Mexican Power Company (described in the *Electrical World* April 18, 1914). This concern is now controlled by British capital, and it was intimated that the option quoted a figure considerably below the original cost of the installation. The general impression seems to prevail, said Mr. Kerr, that the bulk of foreign capital invested in Mexico belongs to large syndicates and trusts; but this is not the case, for 75 per cent of all foreign capital in Mexico is coming from the small investor.

* * *

Research Work at Nela Laboratory.—Dr. C. E. Mendenhall, professor of physics at the University of Wisconsin; Dr. Knight Dunlap, associate professor of psychology at the Johns Hopkins University, and Dr. W. E. Burge, assistant professor and acting head of the department of physiology at the University of Illinois, have accepted invitations to carry on research work during the coming summer in the Nela Research Laboratory (formerly known as the Physical Laboratory, National Electric Lamp Association). Dr. Willibald Weniger, of the Oregon Agricultural College, has also been secured for special research work during the summer, and Mr. A. F. Wagner, of Purdue University, has been appointed to a temporary assistantship in the laboratory for a part of the vacation period. A research fellowship in ophthalmology in the laboratory has been established for the year 1914-15. The fellowship carries with it an honorarium of $700 and is open to men sufficiently advanced in specialized medical training to carry on an independent investigation of some problem having to do with the effects of light and attendant radiation on the eye. There has recently been established in the laboratory a section of applied science in addition to the section of pure science which was established over five years ago. These sections will be separate and distinct.

* * *

SOCIETY MEETINGS

Pennsylvania Electric Association.—The next annual meeting of the Pennsylvania Electric Association will be held Sept. 8, 9, 10 and 11 at Eagles Mere, Pa., the scene of the first convention of the association.

* * *

Electrical Credit Men Will Meet at Buffalo.—The annual convention of the National Electrical Credit Association will be held at the Hotel Statler, Buffalo, N. Y., on June 20. No stated program has thus far been arranged for the meeting. Officers of the association are: President, Mr. Charles M. Wilkins, Partrick, Carter & Wilkins, Philadelphia, Pa.; vice-president, Mr. Frank M. Pierce, Manhattan Electrical Supply Company, Chicago, and secretary and treasurer, Mr. Frederic P. Vose, 140 South Dearborn Street, Chicago.

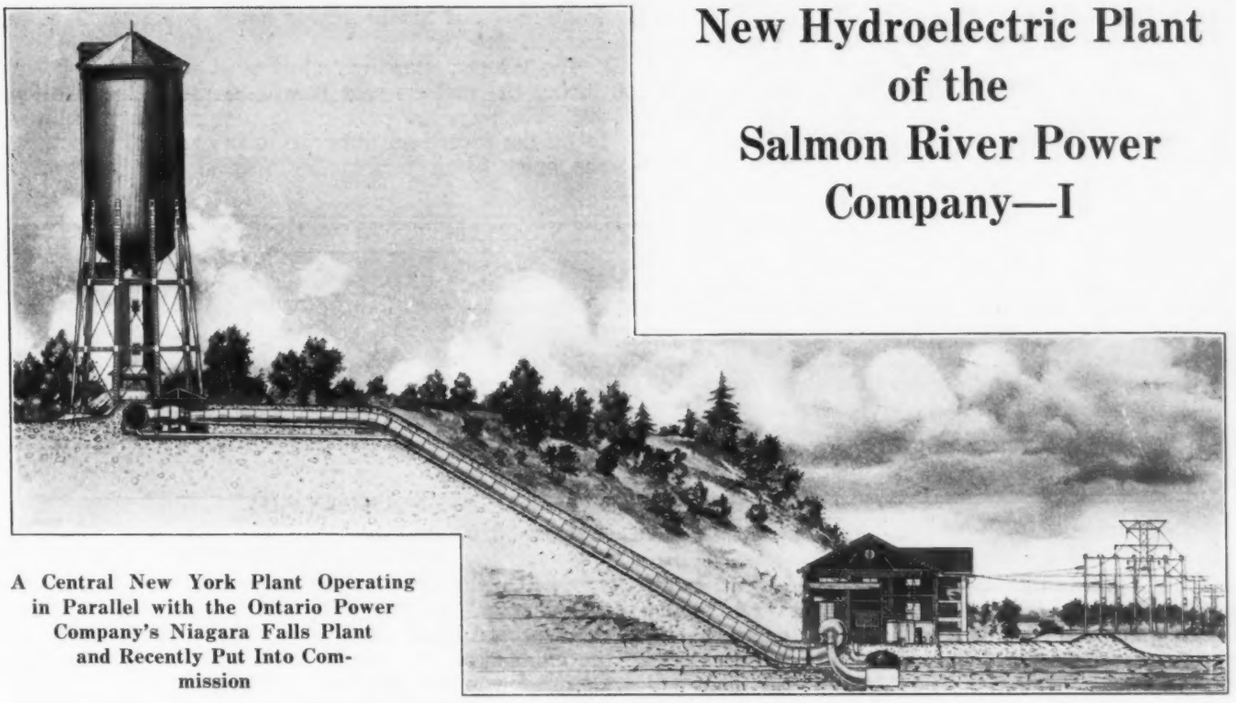
* * *

Joint Jovian and Electric Club Meeting in Chicago.—Members of the Electric Club of Chicago, accepting an invitation of the Chicago Jovian League, met with the latter organization at its regular Monday luncheon June 8. The speaker of the day, Major Carl F. Hartman, chief signal officer of the central department of the Signal Corps, United States Army, spoke on electricity in the army in war and in peace. He sketched briefly the operations of electrically driven machines in gun factories in times of peace, and placed much stress upon the maintenance and construction of lines of communication for an army in the field. One of the facts learned by the army officers is that a single-conductor ground-return circuit gives better service than a double-conductor insulated twisted-pair circuit. A polarized relay has been developed to reduce the weight of necessary batteries for telegraph work. Cavalry maneuvers are reported to the commanding officer by means of small radiotelegraph sets.

* * *

National Association of Corporation Schools.—The second annual convention of the National Association of Corporation Schools was held at Philadelphia from June 9 to 12. The sessions were held at the new auditorium of the Curtis Publishing Company. A number of men connected with the electrical industry were on the program. Among those who were expected to take part in the proceedings were the following: Messrs. Arthur Williams, New York Edison Company; C. A. S. Howlett, General Electric Company; F. C. Henderschott, New York Edison Company; C. P. Steinmetz, General Electric Company; M. W. Alexander, General Electric Company; R. J. Watson, Westinghouse Electric & Manufacturing Company; W. M. Skiff, National Lamp Works; S. W. Ashe, General Electric Company; C. R. Dooley, Westinghouse Electric & Manufacturing Company; J. C. Robinson, New York Edison Company; William H. Tolman, American Museum of Safety, and Dr. C. A. Lauffer, Westinghouse Electric & Manufacturing Company.

New Hydroelectric Plant of the Salmon River Power Company—I



A Central New York Plant Operating in Parallel with the Ontario Power Company's Niagara Falls Plant and Recently Put Into Commission

THE Salmon River Power Company was organized to develop the power of the Salmon River, a stream which flows from the foothills of the Adirondacks in a westerly direction through the northern central part of New York State into the eastern end of Lake Ontario. While the length of the stream is only 44 miles, it drains a watershed remarkable from the hydraulic standpoint in that over a tributary area of 190 square miles there is an average annual rainfall of about 60 in. In addition, the river falls 650 ft. in the 17 miles between Stillwater and the lake and more than 400 ft. in a distance of less than 8 miles. At Salmon Falls the drop is 110 ft. While the flow of the stream is somewhat irregular, the valley above the Salmon Falls is of a form suitable for storage purposes. Moreover, the location of the site is such as to enable the power company to dispose of the entire output of the plant to the Niagara, Lockport & Ontario Power Company, which has leased the property in perpetuity and acquired all its capital stock. The latter company draws its supply at present from the plant of the Ontario Power Company at Niagara Falls and from its own steam plants at Lyons and Auburn. It can utilize the full output of the new plant to advantage in combination with the other three.

Next to the Niagara River the Salmon River is the best source of water-power in the State of New York. Its commercial possibilities for this purpose and as a source of water supply for Syracuse and for waterways through the central part of the State have been under consideration for a long time. In 1889 Mr. J. J. R. Croes, a consulting civil engineer of New York City, studied the river with a view to its utilization as a source of supply for Syracuse, about 40 miles away. He found the cost to be prohibitive. In 1898 the United States Board on Deep Waterways made surveys of a Salmon River basin with the view of building a dam a short distance above the Salmon Falls. This project was designed to supply water for a section of a deep waterway from the ocean to the lakes, following the Oswego and Mohawk Rivers route. A map showing the plan, dated 1899, can be found in a comprehensive report submitted in 1900. In the fall of 1900 the United States Geological Survey established the first stream-gaging station on the river at Fox's Bridge, where regular measurements were carried on for a considerable period. Other studies of the stream flow were made later by private parties.

Power Developments

Numerous small water-powers for local purposes had developed along the river, and of these a census was made in 1908 by the New York State Water Supply Commission. A year later the Oswego County Light & Power Company applied to the Public Service Commission for permission to issue securities to build a 15,000-hp plant. This was given soon thereafter, and the sale of $2,353,000 in 5 per cent fifty-year bonds out of a total issue of $4,000,000 was authorized. The company was also allowed to issue common stock of a par value of $750,000. The rights of this company were later acquired by the Salmon River Power Company, which is now completing the construction of a 30,000-hp plant.

The new company made a complete set of surveys in the spring of 1911 and followed this work in the fall by making numerous borings and test pits. On the basis of the data thus obtained the dam was located near Stillwater at a point about one mile above the Falls where the river banks form ideal abutments. A site for

FIG. 1—WOOD-STAVE PIPE LINE

the power house was selected 2 miles below, where a branching of the riverbed furnished an excellent natural tailrace.

The Hydraulic Works

From the hydraulic standpoint the features of interest are the concrete dam and spillway situated near Stillwater, the artificial lake about 8 miles in length and 5½ square miles in area, impounded by it, the 2-mile conduit of wood-stave and steel pipe, the distributer in which the conduit terminates, the enormous and novel surge tank, the Johnson valves in the penstocks, the penstocks themselves, the turbines and their governors, and finally the tailrace. With the aid of the illustrations a comprehensive view of these parts of the installation can be readily obtained and only the salient features need special description.

From the Reservoir to the Penstocks

The Salmon River is of the kind found all through the lake district of central New York. The riverbed is at the bottom of a narrow valley with rather steep hills rising on both sides. At places the valley widens considerably, as, for example, just above Salmon Falls; at others it narrows into a gorge with steep banks, as at Stillwater. By the location of a dam at the latter point with a crest at an elevation of 935 a large area was submerged with little loss of property, as the valley is sparsely settled. Only a dozen or so of dwellings, including several on the edge of the village of Redfield, and a few miles of highway had to be relocated. The height of the dam crest is limited to about 935 unless more extensive dikes are built to prevent diversion of the water into the watershed of the streams draining into Oneida Lake, several of which take their rise on the south side of a narrow ridge which parallels the Salmon River closely on the south.

Fig. 2 shows the location of the dam and the artificial lake, which has a capacity of 2,600,000,000 cu. ft. with the dam crest at 935, and, at the average rate of flow of the stream, about twenty days are required to fill it. With the crest at this height the average net head produced at the power house less than 2 miles away is 245 ft.

The present temporary crest is at elevation 924, but during the present year it will be raised to elevation 935. Keyways are provided in the temporary spillway to tie the future concrete cap to the present structure, the crest being temporarily formed with a wooden apron. On the down-stream face of the dam is a 25-hp Pelton wheel for the gate drive, connected by long shafting and bevel gearing to a longitudinal shaft in the gatehouse. By means of clutches the gate-raising mechanism is connected to this shaft.

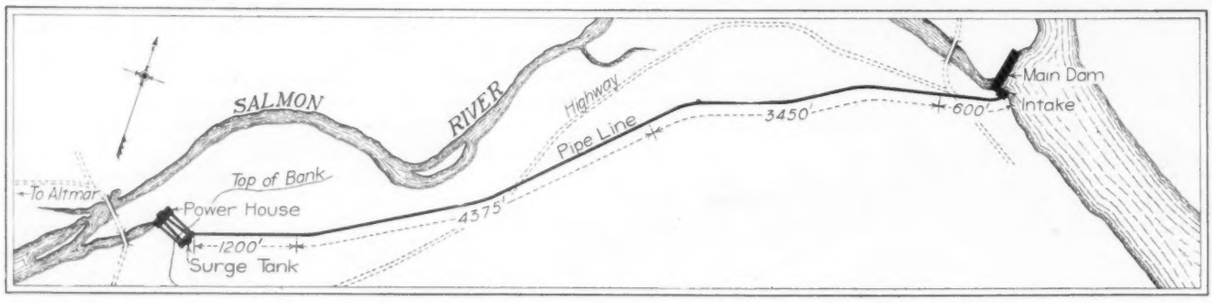


FIG. 2—MAP OF SALMON RIVER HYDRAULIC DEVELOPMENT

The conduit connecting the dam and the power house consists of five sections, a 600-ft. reinforced concrete-lined tunnel drilled through rock, a 7825-ft. length of wood-stave pipe, a 1200-ft. length of steel pipe, a steel distributer and four short penstocks. The topography of the country between the dam and the power house, which is situated at Bennett Bridge, is such that an open canal could have been used. The pipe line, however, was found to be cheaper.

The tunnel was necessary at the dam end of the line to pierce the southerly ridge previously referred to. It is lined with concrete not less than a foot in thickness with circumferential reinforcing rods closely spaced, and it has an inside diameter of 12 ft. The wood-stave pipe continues at the same diameter for 3450 ft., the diameter being reduced to 11 ft. for 4375 ft. more. The staves are of kiln-dried Douglas fir cut not less than 3⅝ in. thick for the 12-ft. pipe and 4 in. for the other. They are joined end to end by means of galvanized-iron keys and are held circumferentially with bands of ⅞-in. and 1-in. steel rods. Each band is in three sections, all united by cast-iron clamps. In soft ground the pipe was supported on timber cradles, but otherwise it was laid directly on the surface. It was coated on the outside with Avenarius Carbolineum and afterward back-filled to about one-half its height. Relief valves were inserted at intervals to preven undue pressure when emptying the pipe, and to serve as air outlets when filling, and drains were placed at all low points. The engineers

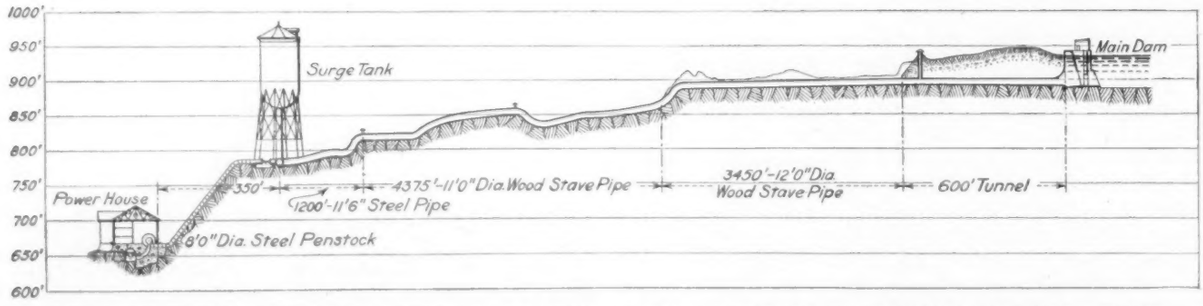


FIG. 3—SECTIONAL ELEVATION, SHOWING RELATION OF DAM, PIPE LINE, SURGE TANK AND POWER HOUSE

selected wood pipe for that part of the conduit in which the pressure was not too great because, in the cold climate of the region, it is cheaper than steel pipe when the latter is properly protected from freezing. Fir was used because it is an excellent wood for pipe not subjected to alternate wetting and drying in that it remains tight, does not rot and is reasonable in price.

The steel-pipe section is 1200 ft. in length and 11½ ft. in diameter. It is connected to the wood pipe through a slip expansion joint packed with oakum and lead wool. Special attention was given to the material in this pipe, which was specified as open-hearth steel containing not over 0.05 per cent sulphur and between 0.3 and 0.6 per cent manganese. The phosphorus was limited to 0.06 per cent if the steel was made by the acid process and 0.04 per cent if by the basic process. The thickness of the pipe is ⅝ in. throughout. The steel pipe was mounted on concrete saddles 20 in. thick and spaced about 14 ft. apart. It was laid in a shallow well-drained trench and a 6-in. sewer tile was molded in the bottom of each saddle to facilitate drainage. The pipe was housed over with a substantial structure of framing and boarding continued down to the ground

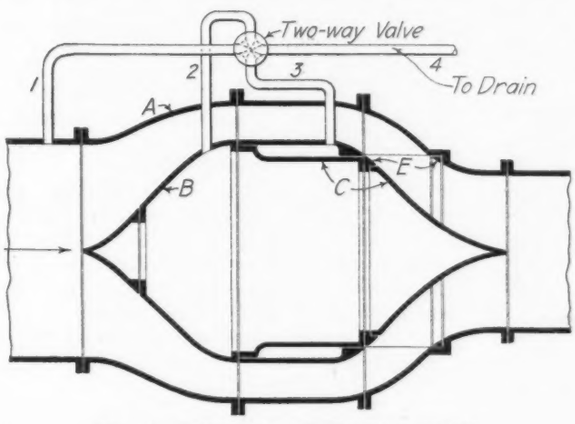


FIG. 4—JOHNSON HYDRAULIC VALVE

level. The roof, of 1-in. boards, was covered with a layer of roofing paper. Trap doors were placed in the roof over all manholes.

From Distributer to Tailrace

The more novel features of this plant are found in and near the power house. On the crest of the ridge just behind are not only the most conspicuous but also the most original elements of the hydraulic equipment. First there is the distributer, a 12-ft. steel pipe 210 ft. in length and joined at one end to the pipe line in a huge concrete anchor block. The other end is closed by a bulkhead. The elevation of the bottom of the distributer is 775 ft., or 160 ft. below the crest of the dam.

From the center of the distributer a 12-ft. riser branches off to a surge tank. This enormous T-connection requires reinforcing from side to side, and this is provided by a 9-in. bolt, 25 ft. long, with bearing washers for the nuts 4 ft. in diameter. The surge-tank riser joins the distributer with easy curves, but a novel and cheaper connection is made to the penstock intakes, 8 ft. in diameter. This is a simple flanged and riveted joint, which would, without some modification, produce eddies and loss of head. To prevent such, wooden fillers suitably rounded off are secured around the mouths of the intakes inside the distributer.

The distributer is a steel pipe, ⅝in. thick, inclosed in concrete.

The surge tank, built by the Kennicott Company of Chicago Heights, Ill., is the largest of its type yet constructed. It consists of a cylindrical shell, 50 ft. in diameter and 80 ft. high, surmounting a hemispherical bottom which adds 25 ft. to the height. Its capacity is, therefore, 1,400,000 gal. The tank is supported on ten columns with heavy concrete footings. It and the riser are housed in with a framed wooden structure providing a surrounding air space which can be heated when necessary from a small house below. The top of the roof of this structure is 205 ft. above the ground, and the top of the tank is high enough above the crest of the dam so that if the flow of the water in the pipe line were suddenly interrupted its energy would be absorbed by the rise in level in the tank without overflow.

An important feature of the surge-tank riser remains to be mentioned. With a 12-ft. riser opening into the bottom of the tank there would not be friction enough to absorb the energy of a surge, which would therefore tend to set up oscillations. To provide for the damping

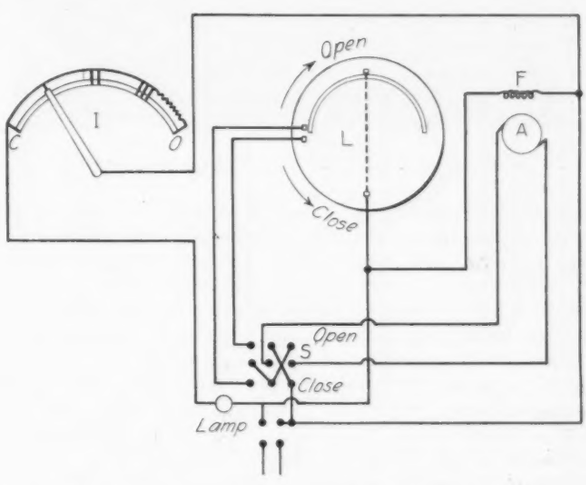


FIG. 5—WIRING DIAGRAM, HYDRAULIC VALVE CONTROL

of such oscillations, a smaller pipe is mounted inside the tank, connected directly to the riser below and terminating in a funnel near the top. The rest of the mouth of the riser at the bottom of the tank is covered by a ring in which small ports are provided. In action, therefore, a surge produces a rise in the small pipe and some flow through the ports. The head in the small pipe then forces the surplus water through the ports and equalizes the pressure gradually. This process is technically termed "differential action" and is an invention of the hydraulic engineer of the Ontario Power Company, Mr. R. D. Johnson.

The four 8-ft. penstocks are connected to the intakes through valves of a type which represent a comparatively new development in hydraulic practice. They operate under a head of nearly 154 ft. The type of valve used is also the invention of Mr. Johnson, manufactured by the Wellman-Seaver-Morgan Company. The valve is shown herewith, with part of the piping, and in diagrammatic section. It consists of a casing *A* supporting an internal stationary shell *B* pointed against the direction of water flow. A hollow plunger *C*, movable in the shell, carries a bronze ring *E*, which seats on a second ring *E*. The motion of the plunger is controlled by a two-way valve through piping as shown in the figure. The piping has four parts. No. 1 is tapped into the penstock, No. 2 into the space behind the plunger, No. 3 into a space between the plunger and the shell, while No. 4 discharges to the air. The operation of closing the valve consists in opening pipe 1 into pipe 2 and pipe

3 into pipe 4, putting pressure behind the plunger and gradually seating it. To open the valve pipe 1 is opened into pipe 3 and pipe 2 into pipe 4. The plunger can be stopped in any position, and an indicator, mechanically connected with it, shows its position. The two-way valve is motor-driven with electrical control on the main switchboard, the circuits being as shown in another

FIG. 6—SURGE TANK, POWER HOUSE AND TAILRACE

figure. The motor *FA* is started by means of the triple-pole, double-throw reversing switch *S* and stopped by the limit switch *L*, operated by the mechanical indicator *I*. The switchboard operator needs to know that the valve is being operated properly, although he is not concerned with its exact position. To give him a rough indication, a pilot-lamp circuit is closed at the quarter position of the indicator *I*, once for quarter, twice for half, and three times for three-quarters open. In the closed position the lamp shines brightly, but in the open position it is dimmed by means of resistance.

Below the valve houses are the four 8-ft. penstocks, anchored above and below in heavy concrete blocks, and laid in trenches and entirely back-filled. The steel plates vary in thickness from ½ in. on the upper horizontal portion of the penstocks to ⅞ in. at the lower end where they enter the power house.

The 10,000-hp Turbines

The four turbines are of the Francis horizontal, single-spiral, double-discharge type of 10,000-hp rating each. They are provided with outside, balanced wicket gates operated by Lombard governors. These machines have guaranteed efficiencies of 82 per cent at full load, 85 at three-quarters load, 80 at half load and 70 at quarter load. The specifications on governing permit not more than 15 per cent increase in speed above the normal value of 375 r.p.m. on the sudden removal of full load, 6 per cent for half load, 3 per cent for quarter load, and 1.5 per cent for tenth load. The turbines are provided with heavy flywheels to assist in governing and to facilitate the operation of the electrical equipment of the plant in parallel with the Niagara, Lockport & Ontario Power Company's system. The turbines are provided with relief valves operated by the governors, so that the sudden checking of over-speed cannot result in an excessive rise of pressure.

The discharge of the turbines is conducted to the tailrace through short concrete draft tubes, entering at an obtuse angle to prevent eddies. In fact, on its entire journey from reservoir to tailrace the water is led with as few turns as possible and around easy curves. The tailrace is directly under the power house, which is built over the bed of a branch of the river that previously carried water at times of flood and was with little expense transformed into a tailrace. The exit of the tailrace from the building is closed by a curtain wall which prevents the ingress of cold air. The old river-bed, below the building, was cleared out for a distance of several hundred feet, and the banks were reinforced with dry-laid stone walls.

The Power House

The power house is a simple structure consisting of reinforced-concrete pilasters connected with heavy concrete beams. The panels are filled with red brick outside and sand-lime brick inside. The roof, supported on steel trusses, is 3 in. thick, of gypsum composition reinforced with steel cables and rods. This is the Metropolitan Fireproofing Company's system and was installed by the Keystone Fireproofing Company. The roof is covered with an asphalt coating overlaid with several layers of asbestos felt. One purpose in the use of this particular type of roof was to secure a fireproof base to which tile could be nailed in case it was later found desirable to add a tile roof. The gypsum roof is very light and was easy to place.

The building is rectangular with a projecting feeder bay. The interior is open to the roof and, with the exception of a gallery about 12 ft. above the main floor on the feeder-bay side, forms one great room. It is served by a 40-ton Shaw electric crane with main and auxiliary hoist all driven by 250-volt direct-current motors. The crane has a 38-ft. span and the runway covers the entire length of the building.

Coming now to the foundations of the building, the construction already briefly referred to is especially interesting in that the intake pipes, the draft tubes and the discharge tunnel are all directly under the building, embedded in or formed of concrete which rests on solid rock. The arrangement of draft tubes, tunnel, etc., is shown in the accompanying plans and sections. They are laid out in this way to insure simplicity of construction and reliability of operation.

Electrical Features of the Power Plant

Each of the four electrical generating units consists of a 375-r.p.m., 6600-volt, twenty-five-cycle, three-phase generator with exciter mounted on an extension of the shaft; three 2200-kva, single-phase, twenty-five-cycle transformers with a normal ratio of 6600 volts to 34,650

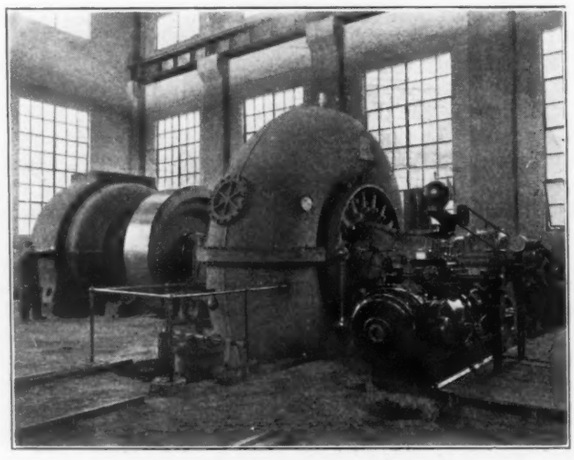


FIG. 7—NO. 1 UNIT, POWER HOUSE

volts, with high tension in star, giving 60,000 volts line voltage; a 6600-volt, 1200-amp, triple-pole, single-throw, type "C" oil circuit-breaker, automatic for reverse power, and the necessary connecting cables and

auxiliaries. Each unit is thus as nearly self-contained as possible, with all parts placed conveniently near together.

The Generators

The generator is of standard form except that the pole faces are furnished with damping grids and the shaft is made exceptionally rugged on account of the use of the heavy flywheel. It is of the semi-inclosed type, and the method of ventilation is interesting in that all the cooling air may be discharged through a single large opening in the top of the frame. It is designed to operate either as a generator or as a synchronous condenser, the plant being meant to be used both for energy generation and for voltage and power-factor regulation. The generator is rated at 5600 kva at 6600 volts and 85 per cent power-factor, and it is designed to carry 20 per cent overload. It is capable also of operating at full current output up to 7500 volts.

On account of the special nature of this plant, the specifications call for high efficiency at half and quarter load. The accompanying table shows the required values.

The regulation of the generators was designed to be such that the plant should operate successfully in parallel with that of the Ontario Power Company at Niagara Falls. The limits allowed at 20 per cent overload were, for 100, 90 and 80 per cent power-factor, 12, 25 and 28 per cent respectively. The liberal allowances are naturally associated with low values of short-circuit current, the limits being ten times normal full-load current on instantaneous and one and three-fifth times on steady short-circuit. The variation in wave-form also was limited to 5 per cent for any load within the capacity of the generator having a power-factor of 80 per cent or higher.

Excitation for each generator is furnished by a separate directly connected shunt-wound exciter, each generator requiring from 125 amp and 125 volts at no load, normal voltage, to 235 amp and 245 volts at 7500 kva and 7500 volts. The exciter is adapted to voltage and power-factor control by the Tirrill regulator.

The weight of the complete generator and exciter is approximately 110 tons and that of the rotor about 40 tons.

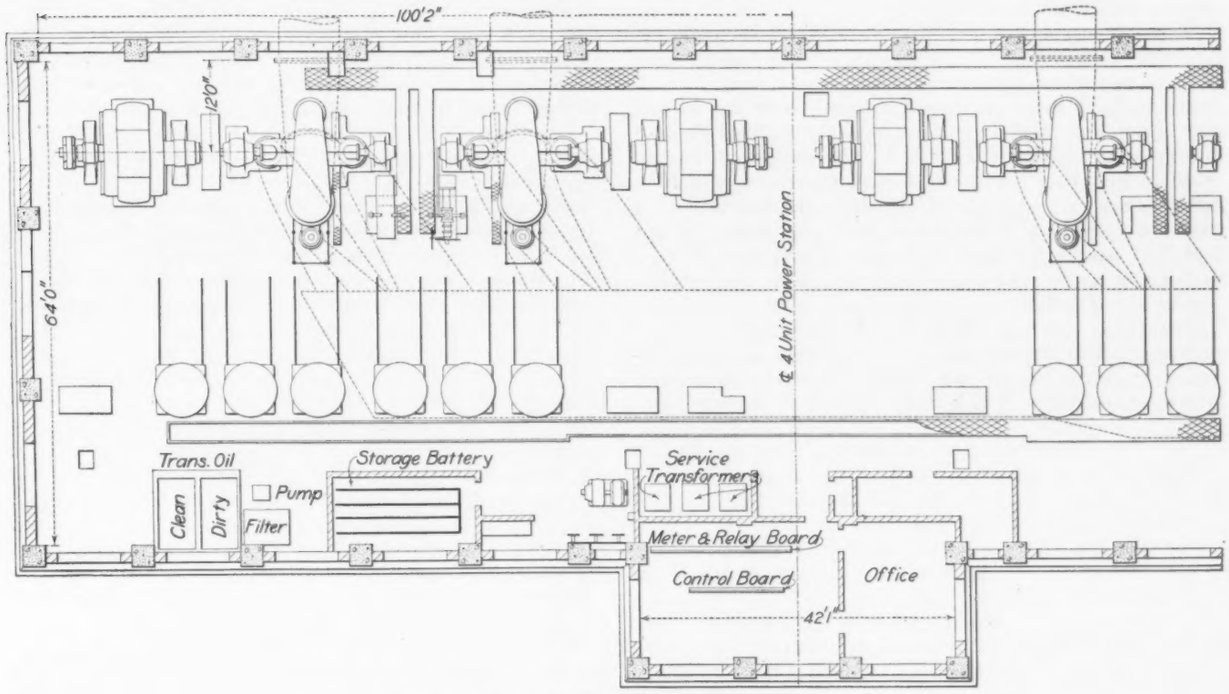


FIG. 8—PLAN OF MAIN FLOOR OF POWER HOUSE

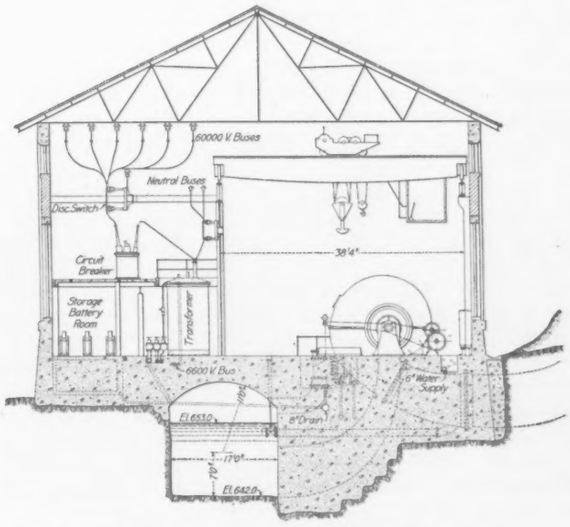


FIG. 9—CROSS-SECTION THROUGH POWER HOUSE

EFFICIENCY DATA ON SALMON RIVER GENERATORS

Volts	Power-Factor	PER CENT EFFICIENCY AT INDICATED PERCENTAGES OF FULL-LOAD CURRENT				
		25	50	75	100	120
6600	100	89.6	93.8	95.1	96.1	96.4
6600	85	87.3	92.2	94.0	95.0	95.5
7500	85	86.1	90.8	93.2	94.5	....

London's Electric Energy Supply

By Haydn Harrison

To those who have not had an opportunity of studying the history of the electricity supply in London it must be incomprehensible how a city of such magnitude should still be catered for by a large number of comparatively small undertakings, many of which are out of date and inefficient.

These concerns are owned by both private companies and local public authorities. Some of the former have been in operation for nearly thirty years, and some of these stations have plants exceeding 30,000 kw in rating. Others of them do not reach 1000 kw. This state of affairs is largely attributable to the action of Parliament in granting powers to local authorities, which in many cases have run the electricity undertakings on a party basis, and also, in the case of companies, to the fact that tenure was limited by the insertion of clauses in the acts under which they operate giving the London County Council the right to purchase in the year 1931. Under these circumstances it is not surprising that such companies require to know where they stand before spending large sums of money on developments. Moreover, schemes which they have put forward for strengthening their position by amalgamation, or supply of power in bulk to areas operating with small generating stations, have generally been quashed on the score of a general scheme being developed before 1931 by the London County Council.

For example, a scheme for bettering the condition of affairs took the form of a bill before Parliament in 1905, the object being to centralize supply and amalgamate various undertakings under the name of the Administrated County of London & District Electric Power Company. In 1908 the London district electricity supply bill was brought forward, but neither of these bills matured, largely owing to the London County Council, which acts as the administrative authority over 121 sq. miles of the London area.

This body has already taken over and electrified the tramway service of London, for which purpose it has erected a generating station having a rating of 34,000 kw. It has now been in operation for nine years and is producing energy at a works cost, including fuel, oil, repairs and maintenance, of 0.66 cent per kw-hr.

It is not surprising that an administrative authority such as the London County Council, having already embarked on the tramway enterprise, should be carefully considering the best way to deal with the motor-service and lighting problem, and Londoners are to be congratulated on the fact that there are indications that a move will be made before 1931, when the Council can enforce its rights of purchase from the companies.

The London County Council in asking Messrs. Merz and McLellan to report on the position and advise it on future policy showed that it wished to deal with the problem on a large scale. This firm of consulting engineers is noted for the bold manner in which it has dealt with the supply of power in bulk in the northern counties and elsewhere. The Newcastle-upon-Tyne bulk supply undertaking, engineered by Messrs. Merz and McLellan, has already plant installed capable of developing 70,000 kw and is rapidly increasing its business.

Messrs. Merz and McLellan's report to the London County Council has now been published, and it must be admitted that it not only deals with the matter on broader lines than is usual in such documents, but also looks further into the future than is often considered necessary.

Investigations for the report lasted over eight months. The two areas under consideration were that of Greater London and 100 sq. miles covered by the county of London, the latter being practically in the heart of the former.

The continued use of the large number of comparatively small generating stations now in existence is not considered, but the cost of production in ten of the best existing stations, hypothetically developed into up-to-date stations of the necessary increased size, is compared with an equivalent single station situated down the river.

It is argued that the economy of concentration lies in the use of large generating sets, and that there is no advantage in having more than ten sets altogether, but as 30,000-kw to 40,000-kw machines are now available and it is likely that 50,000-kw sets are in sight, a generating station having an output of 500,000 kw and containing only ten sets is a probable solution.

As regards the position of such a generating station, it is not considered that, until further development of the Kent coal fields (about 70 miles from the center of London) has taken place, it would be wise to decide on a coal-field site. Moreover, it is estimated that any possible saving in the cost of carrying coal would be lost in the transmission lines. Thus the conclusion come to in the report is that the site or sites should be down the river.

Many of the existing generating stations are situated on the river, but as some of these are "above bridge," where the coal has to be barged, and others are limited in space for coal storage, it is stated that it will not pay to make use of such stations but that it would be wise to erect a new station where coal can be delivered without transshipment.

It is estimated that the initial capital outlay, allowing for growth of demand during the next four years, would be from £6,000,000 to £7,000,000, and that the saving effected in working costs would be £170,000 a year after allowing for all capital charges on new plant and trunk lines. It is pointed out that this saving, in conjunction with the present sinking fund collected, would enable the existing generating plants to be written off by 1931, the date at which the London County Council can take over the present concerns.

In order to form an opinion on the general scheme it is necessary to know the existing position of affairs, and also to estimate the likely conditions which will arise during the next few years.

In the area under consideration £26,000,000 has already been expended by the sixty-five existing undertakings. This includes £8,000,000 spent on seventy generating stations having a total rating of 307,000 kw, or approximately £26 per kilowatt of plant. The average working expenses of all these concerns is 2.2 cents per kw-hr., and the average price obtained 4.58 cents. The number of kilowatt-hours sold per head of population per annum is 48.5, the kilowatts connected per head being 0.07.

There are no less than thirty-one systems of generation, eight different frequencies, twenty-one different distributing voltages and fifty methods of charging.

The proposals laid down by Messrs. Merz and McLellan would eventually amount to a clean sweep of all these generating stations. This would result in a lower cost of generation, but as this gain would have to go in the repayment of loans the consumers would not benefit for some time to come unless the load was increased and the load-factor improved.

There is no doubt that a rapid growth in consumption is likely to occur in certain directions, such as cooking, heating and motor service. But to attain that growth it is essential to reduce the cost to the consumer, and thus the average price obtained per kilowatt-hour unit would be reduced. In New York and Boston the average price is much the same as in Lon-

don, despite the fact that the consumption per head of the population is nearly double. If London, with its huge population, attains within the next few years the consumption per head which now rules in New York, Boston, Chicago and similar large cities, the success of the scheme proposed would be assured.

As regards the engineering features, there is nothing very novel, a high-voltage three-phase system (fifty cycles per second) being recommended. This would connect by means of transformers or rotary converters to the existing low-tension networks, which might cope with the heating and motor load for a time. Extensions would be carried out by means of a three-phase network so as ultimately to standardize this method of distribution.

The most novel feature, so far as English practice is concerned, is the suggested method of operating the proposal. After considering (a) the combination of the existing companies and local authorities, (b) a new company, and (c) a new public authority, it is recommended that an owning and controlling company be formed to finance the scheme and an operating body to take over the management. Reading between the lines, this is a suggestion of municipal control and ownership, the operation being done by existing private authorities. It is quite possible that such a proposal might be carried through with sound financial results. In any case it is to be hoped that some way will be found to interest the present companies, the properties of which are liable to compulsory purchase in 1931; otherwise a condition of inefficiency must exist up to that time. Not that the companies are themselves inefficient, but that there is no encouragement for them to be progressive. A means to insure that money spent on electrical undertakings in London now is a sound investment should be one of the first considerations in remodeling London's supply, which would then advance much more rapidly than has hitherto been possible under the restrictions of compulsory purchase.

Mr. Ferranti, who was the first man to provide London with a high-tension energy supply from the Deptford station, in his presidential address before the Institution of Electrical Engineers laid emphasis on the advisability not only of supply direct from the coal fields, but also of the use of internal-combustion engines with the object of collecting the by-products from the coal. In this connection it is interesting to note that by-product work is hinted at in the report. It is therefore quite possible that when a more detailed scheme is put forward it may contain suggestions which, if carried through, would provide London with a supply of electrical energy generated on lines which are only now beginning to be developed.

It must be borne in mind, however, that as the cost of generation is being reduced to a very low figure, the capital charges become relatively more important unless some means is found to improve the load-factor. London, compared with other towns in England, is not a large manufacturing city, but as a town it is so enormous that nearly every industry is carried out on a scale which would surprise the casual observer. Moreover, its various districts are populated by many different classes. For example, the City of London Electric Lighting Company, which deals with the City area only, is one of the largest and most flourishing concerns, yet the supply after business hours is comparatively small. The West End of London, on the other hand, being purely residential, with a class which does not in any way consider the cost of lighting, produces a heavy load in the evening. The East End of London is one mass of factories and workshops. All these represent a great diversity-factor which, from the point of view of a centralized supply, means a good load-factor. There is therefore no reason why the figures relating to cost of production mentioned in Mr. H. M. Hobart's paper read before the American Institute of Electrical Engineers in February, 1914, based on a 50 per cent load-factor, should not be improved upon under London conditions, and it is likely that, provided the many obstacles now existing be removed from the path of a properly organized publicity and selling organization, the consumption per head of the enormous population of London may reach, if not exceed, the high figure obtained in Chicago and other great American cities.

Electricity in Marine Service

As stated in the *Electrical World* of May 23, two papers on the use of electricity in marine work were presented at the May 19 meeting of the American Institute of Electrical Engineers in New York, as follows: "The Future of Heating and Cooking in Marine Service," by Mr. H. J. Mauger, and "Electricity the Future Power for Steering Vessels," by Mr. H. L. Hibbard. Abstracts of these papers are given below:

Electric Cooking in Marine Service

The recent trial trip of the U. S. S. *Texas* is of special interest because for the first time a large number of men (715) at sea were entirely dependent upon electric cooking for their daily meals. The results of the trial test on the cooking apparatus were discussed by Mr. Mauger. A general description of the electric-cooking equipment and a tabulation of a weekly menu, with the quantities of food prepared, were published in the *Electrical World* May 16.

Data secured during the trial trip demonstrated that the ship's equipment of fifteen ranges and two bake ovens was more than sufficient to care for a crew of 970 men, including seventy officers. The success of the trial is more apparent in view of the fact that none of the cooks had had any previous experience in using electrical apparatus and that they became acquainted so readily with its operation and had no difficulty in performing their prescribed duties.

Of the five ranges installed in the officers' galley four were in use daily. Six to eight of the ten ranges in the crew's galley as well as the two bake ovens were employed simultaneously. Food for 162 men was prepared in the officers' galley and that for 553 men in the crew's galley. The bake ovens proved to be sufficient to supply a crew twice as large as that aboard the ship during the trial trip. The officers' galley was in use from 6 a. m. to 9:30 p. m., except for one hour and a half from 2:30 p. m. to 4 p. m. A few hot-plates were kept in service at all times for heating coffee. The crew's galley was in use from 4:30 a. m. to 8:30 a. m., 10 a. m. to 1:30 p. m. and 4 p. m. to 8:30 p. m., depending somewhat on the daily menu.

Two of the accompanying diagrams indicate the average total daily energy consumption and the consumption over a period of four days subdivided under officers' and crew's galley and bakery. Other curves are shown indicating the variation in load during the preparation of a typical day's meals.

The total daily energy consumption averaged 1258.6 kw-hr.; the highest demand was 1695 kw-hr. and the lowest 806 kw-hr. The downward slope of the curve shows a radical increase in economy occasioned by the cooks becoming accustomed to the use of the electric ranges. It is probable that more extended experience would still further increase this economy. The energy consumed per person per day averaged 1.7 kw-hr. The average total consumption in the crew's galley (556 kw-hr.) was only slightly more than that in the officers'

galley (519 kw-hr.). The average consumption per man per day in the crew's galley was 1 kw-hr., as compared with 3.2 kw-hr. in the officers'. The average daily consumption in the bakery was 182 kw-hr., or 0.25 kw-hr. per man.

In accounting for the difference of the energy con-

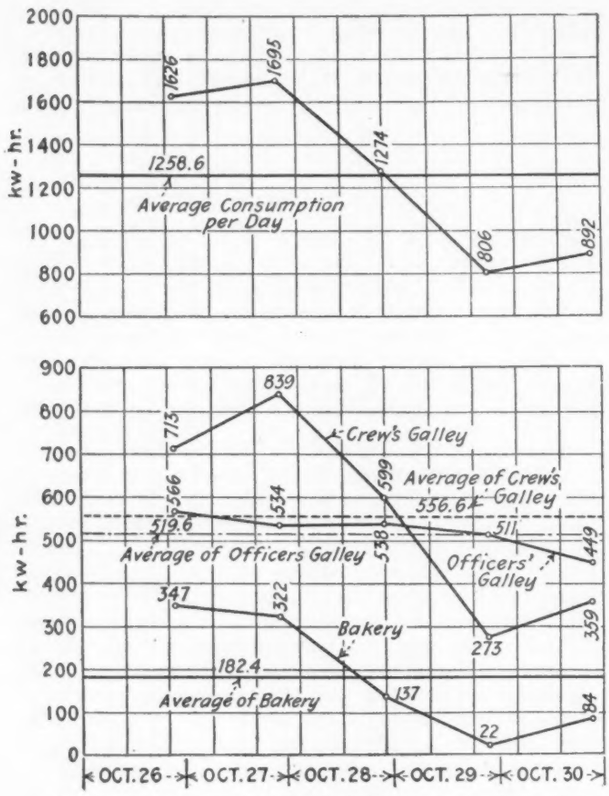


FIG. 1—TOTAL ENERGY CONSUMPTION OF ELECTRIC RANGES AND BAKE OVENS ON U. S. S. "TEXAS"

sumption per man per day in the two galleys, it may be said that about 25 per cent to 30 per cent of the cooking in the crew's galley was performed in steam-heated caldrons, while electricity was used exclusively in the other galley. Another advantage obtaining in the crew's galley was that the ranges could be operated at a better load-factor because more food had to be prepared.

Analysis of one of the daily energy-consumption curves in the officers' galley shows that the average demand was 27.4 kw, while the maximum occurring during the preparation of dinner reached 54 kw. Four ranges were in actual use during the preparation of the particular meal referred to. The ratio of the maximum demand to the connected load was therefore about 54 to 120, and the load-factor about 50 per cent.

During the preparation of a typical day's meals in the crew's galley the average demand was 21.2 kw and the maximum 90 kw, making the load-factor about 24 per cent. Eight of the ten ranges were used, so the ratio of the connected load to the maximum load was 90 to 240. By properly concentrating the cooking in fewer ranges a ratio of 90 to 120 could have been obtained.

The kilowatt-hour curves were taken from wattmeter readings, and the other curves were plotted from ten-minute readings taken throughout the operating periods.

The ranges have a hot-plate area of 888 sq. in.; the broilers measure 18 in. by 24 in. and the ovens 18 in. by 28 in. by 16 in. Each hot-plate requires 1750 watts maximum, each broiler 4000 watts and each oven 4800 watts maximum, making the total connected load in each range 31.6 kw. One range will roast 75 lb. of meat at one time.

The bake ovens require 16 kw maximum and are capable of preparing 100 loaves of bread. The loaves do not have to be shifted in an electric oven to procure good results as has to be done in the coal-fired type, therefore the heat is not dissipated and wasted through open doors.

The ranges are capable of cooking larger quantities of food than coal-fired type of the same size, as the compartments usually devoted to fire and ash boxes are utilized as a roasting oven in the electric type.

Another advantage of the electric range is that it is equipped with a broiler, which the coal range lacks. The broilers can be used for toasting, warming dishes and browning the products from the oven.

Electric Steering of Ships

In the paper on steering ships by electricity, Mr. H. L. Hibbard called attention to the fact that electrical development in the marine field has been confined in a large measure to the navy, and the best experience with electric steering gear has been obtained in the same service. The problem of electric drive is largely one of

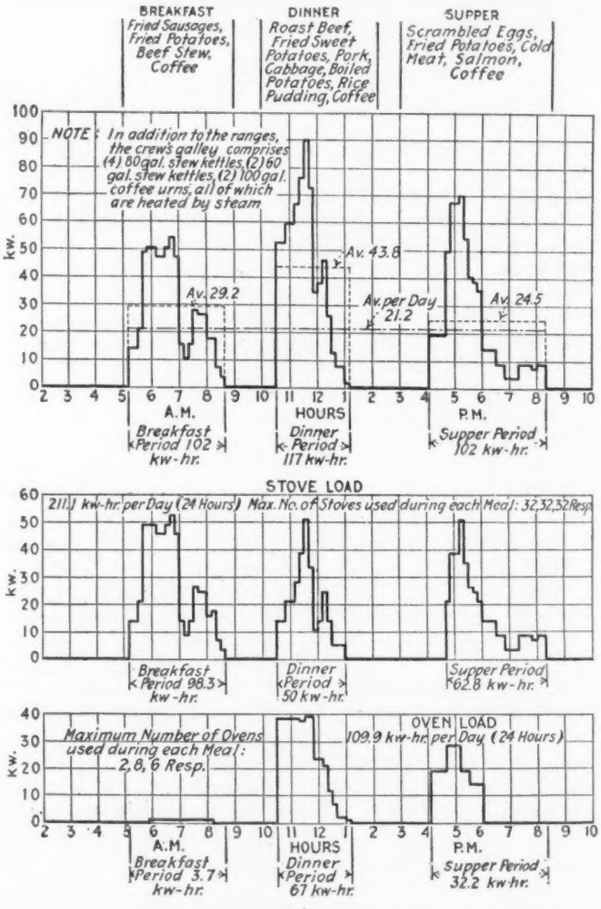

BREAKFAST
Fried Sausages, Fried Potatoes, Beef Stew, Coffee
DINNER
Roast Beef, Fried Sweet Potatoes, Pork, Cabbage, Boiled Potatoes, Rice Pudding, Coffee
SUPPER
Scrambled Eggs, Fried Potatoes, Cold Meat, Salmon, Coffee
NOTE: In addition to the ranges, the crew's galley comprises (4) 80 gal. stew kettles, (2) 60 gal. stew kettles, (2) 100 gal. coffee urns, all of which are heated by steam
kw.
Av. 29.2
Av. 43.8
Av. per Day 21.2
Av. 24.5
A.M.
HOURS
P.M.
Breakfast Period 102 kw-hr.
Dinner Period 117 kw-hr.
Supper Period 102 kw-hr.
STOVE LOAD
211.1 kw-hr. per Day (24 Hours) Max. No. of Stoves used during each Meal: 3,2,3,2,2 Resp.
Breakfast Period 98.3 kw-hr.
Dinner Period 50 kw-hr.
Supper Period 62.8 kw-hr.
Maximum Number of Ovens used during each Meal: 2,8,6 Resp.
OVEN LOAD
109.9 kw-hr. per Day (24 Hours)
Breakfast Period 3.7 kw-hr.
Dinner Period 67 kw-hr.
Supper Period 32.2 kw-hr.

FIG. 2—ENERGY CONSUMPTION OF ELECTRIC RANGES IN CREW'S GALLEY

control. The calculations for rudder and motor horsepower must be carefully made, with the proper assumptions for the conditions presented.

In commenting upon the disadvantages of steam steering apparatus the author brought out the following points: With the boilers amidship, as they are usually

installed, considerable piping has to be employed which has to be arranged to prevent excessive condensation and large temperature rises in the vicinity of powder magazines. The piping may weigh as much as 3 tons, or about 45 per cent of the weight of the steering engine. Considerable steam is also wasted owing to the

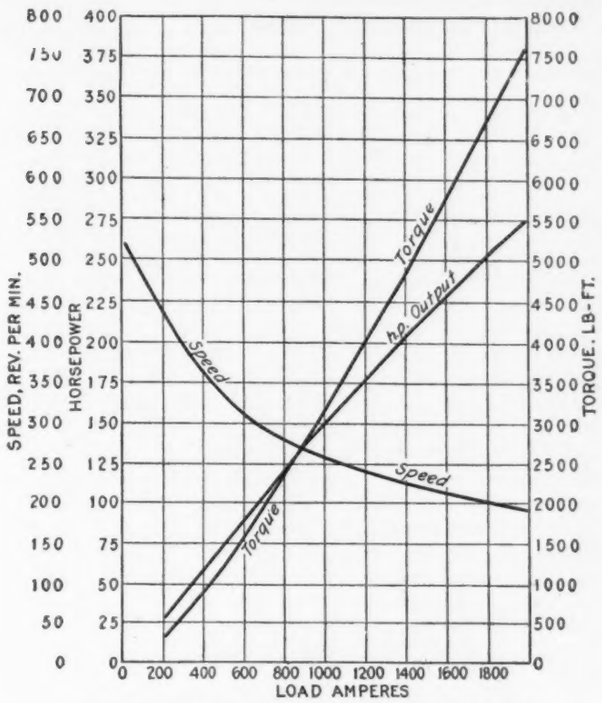


FIG. 3—CURVES FOR STEERING-GEAR MOTOR

method of setting the engine valves. The engines are generally designed to take steam full stroke and are therefore uneconomical. The steam steering engine does not lend itself to overloads like an electric motor does. The reciprocating parts of a steam engine are

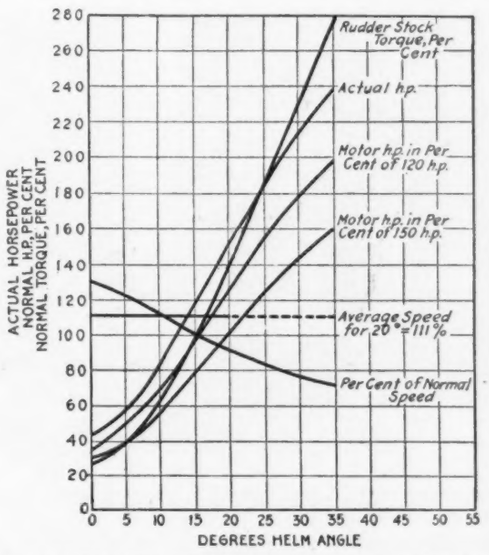

ACTUAL HORSEPOWER
NORMAL H.P. PER CENT
NORMAL TORQUE, PER CENT
DEGREES HELM ANGLE
Rudder Stock Torque, Per Cent
Actual h.p.
Motor h.p. in Per Cent of 120 h.p.
Motor h.p. in Per Cent of 150 h.p.
Average Speed for 20° = 111%
Per Cent of Normal Speed

FIG. 4—CALCULATED RUDDER TORQUE AND POWER CURVES

subjected to excessive strains due to high speed when the rudder approaches its mid-position, while a motor is not. Moreover, the engine has to be operated frequently when the ship is in port to prevent rusting. In addition, the mechanical connections from the bridge to the engine valve are a source of considerable trouble as the wire rope frequently wears out, causing delay and inconvenience.

By using electric steering gear it is possible to overcome most of these disadvantages and obtain more flexible operation. Among the advantages of electric steering are: Reduction in weight and space occupied by the steering mechanism; suppression of heat; elimination of accidents incident to bursting of steam pipes; reduction of vibration; obtaining of more efficient operation; simplification of control apparatus; increase in rapidity, and accuracy of response of the rudder to the control mechanism.

Several forms of electric steering apparatus which have been developed were described. The steering equipment on the U. S. S. *Texas* and *New York*, which is similar to that on the *Des Moines* and the *Mississippi*, was also described. The apparatus on these ships consists of a rudder motor, disk brake, main automatic controller, resistance, and master controller. The master controller is small and made of brass so it has no magnetic influence on a compass if installed near one. Starting, stopping, slow and fast speeds and reverse are controlled by moving the switch handle away from the vertical about 60 deg. No follow-up system is employed, so the motor will run as long as the switch handle is turned and will stop when the handle is released. The motor is rated at 150 hp, 250 r.p.m., and is 50 per cent series and 50 per cent shunt-wound, giving variable speed and torque characteristics. The rudder can be turned from 20 deg. right to 20 deg. left in twenty seconds.

ACTUAL POWER REQUIRED FOR STEERING ON U. S. S. "TEXAS"

Status of Ship	Speed of Rudder Motor	Kw Peak	Kw Steady
At anchor	Full speed	146.4	18.0
	Half speed	146.4	96.0
Full speed ahead	Full speed	146.4	13.2 with stream 48.0 against stream
	Half speed	146.4	96.0
Full speed astern	Full speed	156.0	18.0 near amidship
	Half speed	156.0	96.0 all conditions

The remainder of the paper was devoted to explaining the methods of calculating the engine horse-power required, describing results obtained in actual practice, etc. From data got on the trial trip of the *Texas*, the maximum torque required to move the rudder from hard-over to hard-over was found to be greater than that required for moving the rudder from mid-position to hard-over. This is accounted for by the change in the direction of the stream flow against the rudder. While full speed astern in general imposes the most severe conditions on steering, yet this was not the case on the *Texas*, probably because a balanced rudder was employed.

Growing Telegraph Poles Baffle East African Ants

On an East African telegraph line living trees are used to support the wires in order to escape the destructive ravages of the white ants, which attack the poles but not the trees. The latter are planted along the line with their branches cut off. They readily take root and need only to have their branches trimmed from time to time. The wires are affixed by means of tarred cords of hemp in place of insulators. Eventually the trees will be replaced with iron poles, which will be equally unattractive to the insects.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

"Four Million or More, July First or Before"

Taking the above phrase as its slogan, the Edison Electric Illuminating Company of Boston has been conducting a campaign to increase its connected load to or above the equivalent of 4,000,000 50-watt lamps by the end of the first six months of 1914. At the beginning of March, 3,786,011 50-watt lamps or their equivalent were connected to the system. During the last few weeks in May contracts for about 1000 kw were secured, and on May 31, 3,893,700 50-watt lamps or their equivalent were connected or contracts for service had been secured therefor.

Attractive Central-Station District Store in Montreal

The uptown branch office and store of the Montreal Light, Heat & Power Company, at 358 St. Catherine Street West, is in the heart of the retail shopping district and one of the most attractive establishments of its kind in eastern Canada. Customers find in this branch office as representative a display of electrical appliances as in the headquarters showroom on Craig Street. The accompanying halftone illustrates the diversity of equipment displayed without undue crowding in a comparatively small space, the store being only 25 ft. wide and about 20 ft. long in the section photographed. As a whole, the store is 73 ft. long and both gas and electric appliances are displayed, the arrangement being convenient for the merchandising of household equipment, the payment of bills and discussion of business by customers and employees.

EXHIBIT OF ELECTRICAL APPLIANCES IN MONTREAL CENTRAL-STATION SHOWROOM

The store is lighted by eight 400-watt lamps mounted in pear-shaped translucent reflectors hung from the ceiling 11 ft. above the floor, the latter being 13 ft. high and painted white. Each of the windows is 7.5 ft. long by 5 ft. deep, lighted by three 150-watt lamps mounted in corrugated metal reflectors at the top of each bay. A sign bearing the company's initials is mounted above the door on the outside, there being fifty-six 60-watt lamps in the display. For the display of portable appliances the company utilizes a standard table, shown in the foreground and equipped with six outlets wired from below the top, the table being 8 ft. long, 3.5 ft. wide and 30 in. high, with a lower shelf for the display of flatirons, toasters, hot-plates, etc. Two outlets are provided on each of the interior columns, and a table can be energized by a flexible connection of any convenient position. At the right are six wall panels equipped with gas and electric-fixture outlets and an electric-range display which is in line with the route to the cashier's office. By placing the latter at the rear of the store each customer is led to see the display as a whole when paying bills in person. Other features are a glass case for the display of small appliances, a fireplace equipped with three 250-watt luminous radiator tubes, and an old portable Thomson watt-hour indicator shown at the left of the table, which is calibrated in terms of the cents per hour required to operate appliances at the company's motor-service rate.

Demonstrating Vacuum Cleaner on Mule's Hide

The Scranton (Pa.) Electric Company recently attracted and held a large crowd of people in front of its offices by demonstrating the effectiveness of a vacuum cleaner on the coal-begrimed hide of a mine mule. The animal, having probably never experienced a similar sensation before, expressed its surprise when the vacuum cleaner was put in operation by delivering a far-sounding "hee-haw." The noise soon attracted a crowd which watched the demonstration and probably carried the news to more quarters than any other form of advertising might have done.

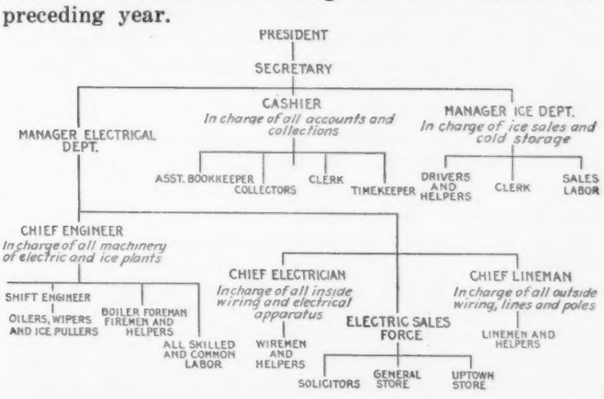
ELECTRICITY, THE VACUUM CLEANER AND THE MINE MULE AT SCRANTON, PA.

Staff Organization in an Ice-Electric Plant

The Brenham (Tex.) ice-electric company operates an 800-kva electric plant and a 40-ton ice plant. Mr. J. R. Kennedy is secretary of the company and manager of the ice and electric departments, and the responsibilities and duties of each sub-department head and employee are clearly shown by the accompanying "organization tree," a framed copy of which hangs in each sub-department. The arrangement illustrated has now been in force nearly six months and has been attended by very gratifying results, according to Mr. Kennedy. Harmony exists in all departments and still further improvement is expected in the future, when changes in accounting methods will contribute to the efficiency of the organization.

The cashier is directly subordinate to the secretary and is responsible for the accuracy, competency and efficiency of the office force. He has full and direct charge of all books and accounts, receives all collections, and makes all disbursements.

It is his duty to render the secretary a weekly report, showing the recapitulation of the weekly pay roll, and a monthly report, setting forth the gross income for the current month, the operating expenses and a comparison with the business done during the same month of the preceding year.



ORGANIZATION CHART OF ICE-ELECTRIC COMPANY

These reports are of much value to the president and manager, as they show fully the condition of the business at a time when defects can be easily corrected, instead of waiting until the end of the fiscal year.

The manager of the electrical department is directly subordinate to the president and is clothed with full executive power for the proper management of his department. He supervises all current purchases of apparatus and machinery, approves contracts for wiring, determines credit to be extended customers, handles the advertising, computes rates and holds his subordinates responsible for the proper performance of their duties.

The manager of the supply department issues no material to any sub-department of the company unless it is properly requisitioned on regular forms stating the purpose for which it is to be used and is signed by the sub-department chief. He receives all incoming and dispatches all outgoing material, checks the prices and freight, and turns the invoices in to the cashier, with the proper notation. The cashier rechecks them and submits them to the manager for final approval.

Material issued to sub-departments is entered under date and requisition number in a record provided with columns giving the correct distribution. This record is posted periodically to the proper controlling accounts in the general books.

No material is issued for house-wiring work until a signed contract has been obtained from the customer.

A sales book of special design is used in the stores for sales to customers. It is made in triplicate with the originals perforated, so that one can be torn out for each sale. There are eight of these small invoices to the page, each extending only one-half the width of the book. The duplicate and triplicate are ruled beyond the margin of the original, with columns for cost of article, its selling price, cost of labor and its selling price. The original goes to the customer, the duplicate is turned in to the cashier daily with the cash sales, and the triplicate is retained in the book for store reference and record. This book eliminates the necessity of a recapitulation at the end of the month.

All the employees and all of the equipment of the mechanical department are under the direct control and authority of the chief engineer. This department must be kept up to the highest point of economy and efficiency. Daily reports, showing a complete operating history of the plant for the preceding twenty-four hours, are made on regular forms and turned in to the manager every morning. The report shows the units operated, hours each runs, their condition, the output, the fuel consumed, lubricants used, and so forth. The daily reports are progressive; that is, the totals of output and fuel consumed are carried forward daily.

Any dispute arising is arbitrated by the manager, who takes special care to permit no wrangling or friction to exist in his force. All men in authority are required to respect others in like position, and no one must exercise authority over men who are not directly under him, except with permission from their superior.

When men belonging to one department are at work in another department, the chief of the latter department is not permitted to interfere with them unless they have been placed under his charge by their superior. Any failure of the one force fully to co-operate with the other must be reported to the manager.

Encouraging Display-Window Illumination in Lieu of "White-Way" Lighting

The value of merchants' illuminated window displays as a practical means of lighting the downtown thoroughfares of small cities in lieu of "white-way" installations obtains recognition in the annual report of recommendations on civic topics recently submitted by the Charlottesville (Va.) Chamber of Commerce. The solution proposed is one of direct interest to all those who have to do with the problems of lighting the business sections of small communities, and the recommendations made have been painstakingly worked out upon lines which, while reducing the general lighting burden on the taxpayer, yet give to the merchants the advantages of lower energy cost and increased show-window publicity.

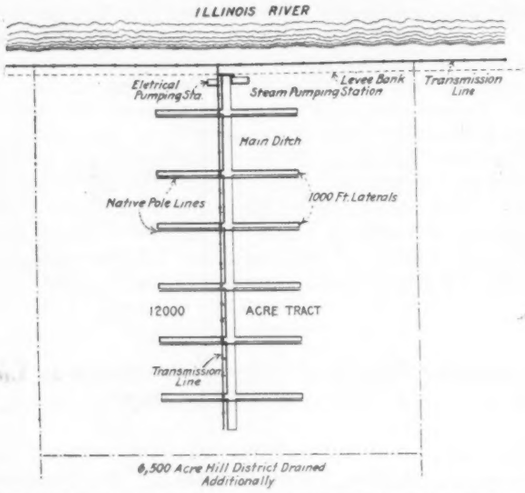
Four moving-picture shows keep the main streets of Charlottesville lively until about 10:30 p. m. By the proper lighting of the windows of all the local stores, and with these window installations kept in operation until, say, the closing time for the picture shows, a street illumination could be secured which, it is pointed out, would be even superior to that of so-called "white-way" lighting. Moreover, the advertising value of such window displays when inducements are offered to people to stroll through the business district before or after the picture shows gives the plan the aspect of a business proposition from the merchants' standpoint, rather than an expense and outlay on their part made solely for the benefit of the public. It is further recommended that this subject of lighting be presented formally to the local

Retail Merchants' Association, asking its support, while the co-operation of the local electric company is to be solicited to the extent of making a special rate for this long-hour window-lighting business, the company lighting and extinguishing the lamps at specified hours.

Transferring Ditch Silt with an Electric Dredge

When the Hillview Drainage and Levee District, a co-operative farmers' association, tilling reclaimed soil along the Illinois River, not far from Hillview, Ill., recently called for bids for cleaning out ditches and laterals on its property, the tenders made by the contractors were found to be twice as large as the amount of money available for the work. It therefore seemed out of the question to clean the silt from the ditches and to deposit it on the land as every farmer knew should be done.

At this juncture, however, the Central Illinois Public Service Company came forward with a plan which will not only save more than a third of the money already collected but has the further advantage of placing the silt taken from the bottom of the ditches upon the



DIAGRAMMATIC SKETCH OF HILLVIEW DRAINAGE AND LEVEE DISTRICT

land in such a fashion that it will add fertility to the soil. The plan contemplates the building of a branch transmission line of No. 4 bare copper along the main ditch of the district and installing in the ditch itself a dredge boat carrying a 100-hp, 2300-volt, three-phase, sixty-cycle alternating-current motor directly connected to a 12-in. centrifugal pump. With this suction outfit connected to the transmission line paralleling the 12,000-ft. main ditch the soft mud will be pumped out onto the land, giving new life to the soil. Clips will be used to connect the motor leads to the transmission line, allowing the boat to travel the length of an entire span without changing the connections.

For cleaning the 1000-ft. laterals pole lines of native timber will be erected and temporary wires will be strung, the dredge boat proceeding up each lateral in turn. In this way ditches draining the entire 12,000-acre tract and its 6500-acre tributary will be freed from the soft mud accumulating in the bottoms.

After the farmers in the district had been shown how the ditches could be cleaned electrically, effecting so large a saving, they naturally began to look at their steam plant askance. The result has been a contract for a 250-hp electrical pumping plant, with the old steam station held in reserve, to be used only at times when the drainage cannot be handled by the motor-driven pump.

The commercial department of the Central Illinois Public Service Company, of which Mr. J. Paul Clayton is contract agent, is highly pleased with the contract, as it will afford the company a twenty-four-hour load, the suction dredge being operated day and night with the aid of searchlamps. In addition the electric-service company has been granted rights-of-way for transmission lines to any point in the district.

Requisites for Success in Selling Electrical Energy

Mr. Louis A. Ferguson, vice-president of the Commonwealth Edison Company of Chicago, gave an able address on "The Successful Salesman" at a recent meeting of the contract department of the company. This address made a deep impression on all those who heard it, and at the solicitation of friends Mr. Ferguson has had it copyrighted. The speaker said that he thought the salesman should be a technically trained man, but by this he did not mean necessarily one who has received technical training in college. The "rotating system" of training afforded by the Chicago Central Station Institute was referred to with approval.

In many cases the question of steam for manufacturing, heating and other purposes enters into the problem under discussion, and it is essential that the commercial representative of the electric-service company be familiar, in a general way at least, with the cost of operation of apparatus using steam, so that he may be able to demonstrate the economy of central-station service notwithstanding these costs. The electric-service salesman should also understand the fundamentals underlying cost of production and be familiar with the influence of load-factor in an isolated plant as well as in the central station. He should be familiar with all details of the cost of operating a private plant, from the coal bin to the lamp or motor, being able to point out, if necessary, defects in the calculated costs as made by architects or engineers.

"Since it is true," said Mr. Ferguson, "that the cost of making electricity depends largely upon the load-factor of the central station and the diversity of its business, the commercial man should know what effect a given piece of business would have on the general cost of producing electricity in the central-station plant, and whether making a contract for a large amount of power would have a tendency to reduce the cost of the whole power generated."

The salesman should have an accurate knowledge of how the rates of his company are determined. Again, the successful salesman must have certain personal characteristics—real qualities which come from the higher cultivation of the mind, from the strength of personal character and from a healthy development of the body. Initiative also is vital to success. A part of the salesman's leisure time should be spent in a study of the technique of the electric-service business, but a part also of his leisure time should be devoted to mingling with men in other lines of business.

In concluding, Mr. Ferguson dwelt on the necessity of courtesy and of presenting one's case clearly and concisely. A salesman should not only establish a reputation for fairness but should be enthusiastic in his work. Even the coldest man is fired by the spirit of an enthusiastic salesman. "Live in an atmosphere of optimism," said the speaker, "for it is the harbinger of prosperity. Determine for yourself a fixed purpose in life and work steadily toward it in a straight line."

Illumination and Wiring

Illumination Tests in New York Department Store

Data are given herewith on illumination tests recently made of the interior lighting of the new Lord & Taylor department store, New York City (described in the May 23 issue of the *Electrical World*). The

RESULTS OF TESTS OF ILLUMINATION IN NEW STORE OF LORD AND TAYLOR, NEW YORK CITY

	First Floor	Second Floor	Third Floor	Fifth Floor
Character of material of surrounding surface:				
Ceiling	Travertine marble	White plaster	White plaster	White plaster
Walls	Travertine marble	White plaster	White plaster	White plaster with wainscoting
Columns	Travertine marble	White plaster	White plaster	White plaster
Floor	Travertine marble	Green carpet	Green carpet	Light-colored wood
Woodwork	Mahogany	Walnut	Walnut	.....
Height above floor:				
Ceiling	18 ft. 5 in.	14 ft. 5 in.	14 ft. 5 in.	14 ft. 8 in.
Fixture bowls	11 ft. 11 in.	10 ft. 2 in.	10 ft. 2 in.	10 ft.
Equipment and rating:				
No. lamps	6	6	6	6
Rating lamps	Three 250 Three 150	150	100	60
Watts per sq. ft.	2.9	2.16	1.44	0.87
Illumination in foot-candles:				
Center bay	12.6	13.2	11.3	9.0
Corners	5.1	7.2	5.4	4.2
Third out on diagonal	11.4	12.1	9.5	8.6
Two-thirds out on diagonal	8.7	9.0	5.8	6.3

ceilings on all floors of the building are divided into bays measuring 19 ft. 10 in. by 21 ft., making the area of each 417 sq. ft. Each bay is illuminated by one fixture suspended at its center. In every case the intensity in foot-candles was measured at a height of 39.5 in. above the floor or in approximately the same plane in which goods are usually displayed.

Direct-indirect fixtures are employed on all floors, color correction being provided on the first two floors by polycase bowls. All of the glassware for the interior fixtures was furnished by the Gleason-Tiebout Glass Company, New York.

Sign Representing Ball Game

Installed in a conspicuous place facing the Fort Pitt Hotel, Pittsburgh, Pa., is a novel electric motion sign which represents the pitcher, batter and catcher going through the usual maneuvers of a ball game. The cycle of effects is as follows: First, the pitcher and catcher "warming up" before the batsman enters the box; second, the pitcher "winding up" and delivering the ball to the batsman, who knocks a foul ball; third, the pitcher throwing a ball which is missed by the batsman, and, fourth, the ball delivered and the batsman knocking a "pop fly" into the pitcher's hands. During the entire operation the figures go through the most lifelike movements, and the ball is represented flying through the air in passing from one position to another.

After the ball game is over the sign legend is illuminated in sections displaying respectively the words "Chew," "Smoke" and the name of the tobacco advertised. In addition to producing the spectacular effects described, the sign indicates the time of day by an electrically illuminated clock, as shown in the cuts. The

FIG. 1—WARMING UP

FIG. 2—BATTER UP

FIG. 3—PITCHER DELIVERING BALL

FIG. 4—A FOUL FLY

FIG. 5—BATTER OUT ON POP FLY

flasher which produces these effects is remarkably simple in its appearance, although it contains 185 contactors besides those used for control. The mechanism consists of three long contactor and control spindles

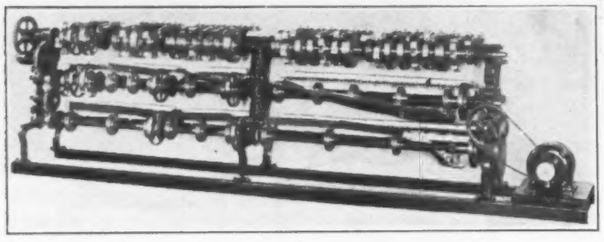


FIG. 6—FLASHER OPERATING SIGN ILLUSTRATING BALL GAME

arranged one above the other. By using control contactors several motion effects are produced without employing a complicated flasher mechanism.

G. G. O'Brien, Pittsburgh, manufactured the sign, and Betts & Betts, New York, furnished the flasher.

Lighting of an Outdoor Tennis Court with High-Efficiency Lamps

BY A. L. POWELL AND A. B. ODAY

The playing of tennis at night has become an established fact. A large number of tennis courts throughout the country are equipped with artificial lighting, thus making it possible for the business man to enjoy the game of tennis outside of his working hours. One may play the game in the evening without the annoyance of excessive heat often experienced during the day, and it is not necessary to stop playing as twilight approaches. One is not compelled to leave his office before work is completed, for he is now able to play after sundown.

There are several fundamental conditions which must be observed in order that the tennis court may be well lighted. The entire surface of the court must be brightly illuminated, and the light must be distributed over the entire surface likely to be traversed by the ball. Therefore illumination must be provided to make the ball visible at all points it is liable to reach.

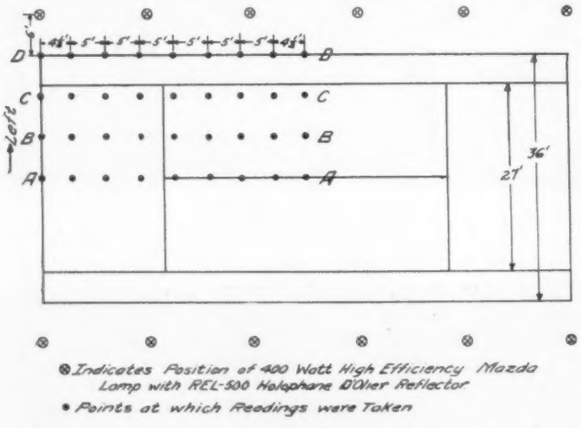


FIG. 1—PLAN OF COURT SHOWING LOCATION OF TEST STATIONS

The surface of the court must be evenly illuminated so that the ball receives the same illumination at all times. The lighting units must be high enough and placed at such positions as to eliminate all danger of glare.

During the last two years many tennis courts have been equipped for playing at night. The standard equipment has been twenty-two or twenty-four 250-watt multiple vacuum-type tungsten lamps with angle-type steel reflectors. These have been extremely satisfactory and have been the cause of much favorable comment from expert players. With the improvement in efficiency of the larger sizes (400, 500, 750 and

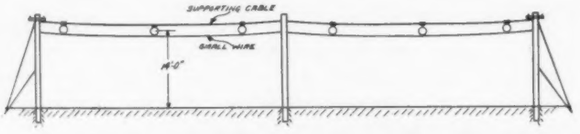


FIG. 2—DIAGRAM SHOWING IN ELEVATION ARRANGEMENT OF LAMPS AND SUPPORTS

1000-watt) it seemed desirable to experiment with these as to their application to this particular class of service.

A standard tennis court was, therefore, equipped as shown in Fig. 1, and various combinations of lamps and reflectors were applied. The most satisfactory arrangement was found to be twelve 400-watt (530-cp) high-efficiency tungsten lamps provided with bowl-shaped reflectors having the holders set at an angle, porcelain enamel and weatherproof, the large socket being part of the equipment.

The lighting units are so placed that their centers come 14 ft. above the court, 6 ft. back from the side lines. The end lamps are in line with the back lines of the court, and the others are equally spaced between these.

Figs. 2 and 3 show the arrangement of equipment in what might be termed "elevation and section." The particular court tested was surrounded by high wire netting, as shown in the day view (Fig. 4), the supporting posts of which serve to carry the pipe goosenecks for the lighting units. Courts not so equipped may have an arrangement as shown in Fig. 2, which is described later.

The night view (Fig. 5) cannot, of course, accurately picture the effect of the lighting. To use a homely expression, "the proof of the pudding is in the eating," and so the success of the lighting lies in the ease of playing the game at night.

The court under discussion has been utilized considerably for night playing, and all players have agreed that no difficulty due to the lighting is experienced. Several observers, most of whom, however, are not experts, have stated that they are able to play with ease almost equal to that of daylight playing. Trouble from glare is not noticeable.

It was with some doubt that the system was installed, as the writers believed that by reason of the greater intrinsic brilliancy of the high-efficiency lamp the glare would be more pronounced than with the earlier type of tungsten lamp. It was a pleasant surprise to note

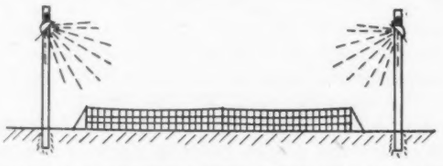


FIG. 3—DIAGRAM SHOWING SIDE VIEW OF LAMP ARRANGEMENT

the effect, which might be described as follows: With the vacuum-type lamp in the porcelain-enamel reflector the filament appears brighter than the surface of the reflector; with the lamp of new construction the whole

mouth of the reflector appears equally bright and at a casual glance one cannot distinguish the location of the filament. It was originally planned to place a diffusing-glass plate across the front of the reflector, hiding the

FIG. 4—DAY VIEW OF TENNIS COURT

filament from view, but observation showed this to be unnecessary.

The distribution of light is very satisfactory, as shown by the tests and observation. Sufficient light is sent upward to enable one to see the highest lobbed ball. Plenty of light is provided from all directions, giving good illumination on vertical surfaces. The most difficult ball to judge is, naturally, one sent swiftly diagonally across the court, parallel to the ground. In this event several light sources are in the field of vision, but the eye seems to be moving so rapidly that the difficulty of judgment is not extreme.

A summation of these comments enables one to arrive at the conclusion that this arrangement is as satisfactory as schemes previously used which have given very good service.

An illumination test was conducted with test stations as indicated in Fig. 1, using a calibrated Sharp-Millar portable photometer with the test plate 3 ft. above the ground. Readings were taken with the test plate in a horizontal plane and turned to the right and left respectively. The variation in illumination lengthwise through the court along four parallel lines is shown in the first four curves in Fig. 6. The fifth curve shows the variation in illumination across the court, each point on this curve being the average of the values along the lines *AA*, *BB*, *CC*, etc. The values plotted are corrected for voltage variation with lamps operated at rated efficiency, namely, 0.75 watt per candle. The letters *L* and *R* indicate the readings with the test plane vertical to the left and right respectively. *H* indicates the readings with the test plane horizontal. The values indicated represent an average of three readings at each position. The average illumination on the horizontal plane was 5.4 ft.-candles; the average

FIG. 5—NIGHT VIEW OF TENNIS COURT

illumination on the vertical planes to the right and left was 3.7 ft.-candles.

For courts not equipped with netting the most economical method of supporting the lighting units will be along the idea suggested in Fig. 2. Here three posts are used at each side and lamps are suspended from a messenger cable. One method of suspension is shown in Fig. 7, where *A* is a screw clamp ear, *B* a

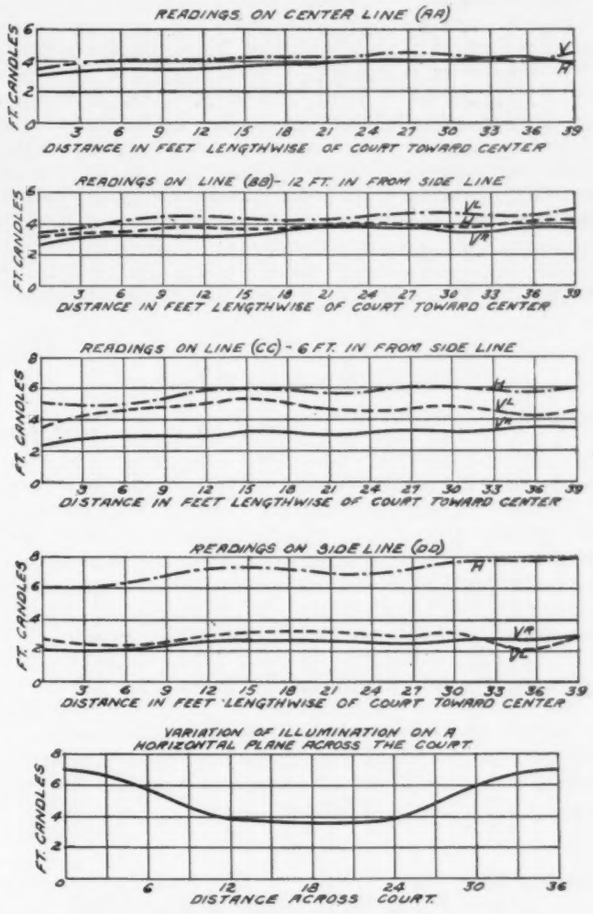

READINGS ON CENTER LINE (AA)
FT. CANDLES
DISTANCE IN FEET LENGTHWISE OF COURT TOWARD CENTER
READINGS ON LINE (BB) - 12 FT. IN FROM SIDE LINE
FT. CANDLES
DISTANCE IN FEET LENGTHWISE OF COURT TOWARD CENTER
READINGS ON LINE (CC) - 6 FT. IN FROM SIDE LINE
FT. CANDLES
DISTANCE IN FEET LENGTHWISE OF COURT TOWARD CENTER
READINGS ON SIDE LINE (DD)
FT. CANDLES
DISTANCE IN FEET LENGTHWISE OF COURT TOWARD CENTER
VARIATION OF ILLUMINATION ON A HORIZONTAL PLANE ACROSS THE COURT
FT. CANDLES
DISTANCE ACROSS COURT

FIG. 6—CURVES SHOWING VARIATION OF ILLUMINATION OVER SURFACE OF COURT

¾-in. by ⅜-in. reducing nipple, *C* a suspension box and *D* a ½-in. by ⅜-in. bushing. Of course, numerous schemes may be utilized for this purpose. Any ingenious electrician can devise a weatherproof hanger from standard pipe or conduit fittings, remembering that the sockets are tapped for ½-in. pipe.

Where the cable suspension is used a small second

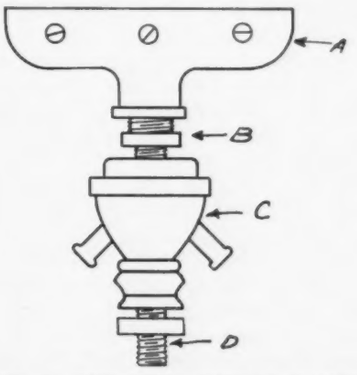


FIG. 7—SUGGESTED TYPE OF HANGER

wire, parallel to the messenger, is advisable. The bottoms of the reflectors should be attached to this to prevent the reflectors from swinging and to assure alignment.

The local conditions will determine the manner in which the current-carrying wires may be run to the lamps. The following is a summary of equipment required for installing the lamps for a standard tennis court, using the cable method of suspension: Twelve 400-watt multiple high-efficiency lamps, twelve angle-steel reflectors, porcelain enamel finish; twelve hangers for supporting reflectors, of some such type as shown in Fig. 7; six 20-ft. posts, 260 ft. of ⅜-in. galvanized-steel wire stranded for messenger cable, 190 ft. of 3/32-in. galvanized-steel wire stranded for lower wire, four guy anchors with turnbuckles and clamps, 600 ft. of No. 8 weatherproof copper wire, 75 ft. of No. 14 weatherproof copper wire (to connect lamps with main circuits), one double-pole 75-amp switch, one fuse block, one weatherproof service box, eight cross-arms with lag screws and braces, sixteen pins and insulators.

Recent Telephone Patents

A patent has been recently issued to Mr. J. Unterholzner, Germany, for an improved type of condenser telephone in which the condenser plates are placed close together with the alternate ones perforated to overcome air-compression effects. The first, fourth, seventh, etc., plates are connected together and to one side of the line; the third, sixth, ninth, etc., are joined to the other side of the line; while the second, fifth, eighth, etc., are connected to the induction coil and the ground. The varying static potentials on these plates cause them to vibrate and emit the transmitted message.

Mr. M. Setter has obtained a patent for a standard hand-type receiver, the magnetic apparatus being mounted in a cup which with the diaphragm is clamped between the ear piece and the receiver shell. The features lie in structural details.

Letters to the Editors

Charges for Electrical Energy

To the Editors of the Electrical World:

SIRS:—The great interest which has been taken in the past six months in the matter of charges for electrical energy must eventually crystallize the rate question into something universally useful. Let me add, therefore, to this discussion one other phase which I believe has hardly been touched upon.

Every engineer knows the complications which arise in any attempt to charge the customer according to the cost of reaching the individual, as likewise every thinking person knows the desirability of charging for the service according to such costs of distribution, but most of us also realize the folly of trying to satisfy the public with a system of charges which no one but a specialist can understand. Sooner or later the public simply will not submit to it. What kind of a mix-up would we have if the butcher or the grocer were to charge for his commodities according to the distance the delivery boy has to go, or according to the time required to put up the order, or according to whether the store man used an auto, a wagon or a bicycle for delivering goods? Is not the public better satisfied and is it not more convenient to pay 2 cents for all first-class, or letter, postage than to have the postal authorities arrange to pay according to distance, number of transfers, etc.? All savings brought about would be eaten up in handling so complicated a system. Let me repeat that sooner or later the public will demand a system which it can thoroughly understand, and that a system requiring a more or less extended knowledge of electrical engineering practice will not do.

The individual consumer will not make a complaint as long as all are charged on the same easily understandable basis, even if he has to pay a part of the cost of reaching his neighbor. It is therefore necessary to avoid unnecessarily complicated systems by restricting the charge for service to factors which depend only on conditions of consumption and taking care of investment charges in some other way. The suggestion of Mr. Tomlinson of basing all charges on only three factors—demand, quantity and time—seems to me to be timely.

In your issue of May 23, Mr. R. S. Hale takes exception to the above restricted method. He would make the consumers pay equally for generating-plant investment and not for underground construction. All are benefited equally by the continuity of service thus made possible; besides, underground construction is usually the result of public action, and every one who uses the service should pay his share. The matter of discriminating between congested territory and regions of scattered consumers can be taken care of by means of a transformer charge similar to the present meter charge, the only difference being that the transformer charge would vary with the size of transformer or number of connections. This charge would disappear when the transformer connections reached a certain number. It is not often that this charge would have to be resorted to, but it would meet with approval from the consumer where an unintelligible rate sheet would not. Mr. Hale intimates that at times a customer must be allowed to specify the payment he will make for service. This is exactly what has happened in many places where the state commissions have actually shown that certain twenty-four-hour consumers, such as traction companies, were getting the central-station energy for less than cost. This result was not intended by the central stations, to be sure, but it shows to what extent the practice of "giving the twenty-four-hour consumer the service at his own figure" can be carried. In quoting these companies a price to obtain their business the central stations had neglected the fact that a twenty-four-hour consumer does not get his energy from capital already invested but that he adds to the capital investment on generating equipment since he uses the energy at peak periods.

State College, Pa. W. M. STEMPEL.

Storage-Battery Load Regulation

To the Editors of the Electrical World:

SIRS:—On page 1032 of your May 9 issue, in the discussion of Mr. F. G. Gasche's paper entitled "Power Problems in Steel Mills," your record of my remarks may be misleading. This report contains the following sentence: "Mr. Milton said that the Electric Storage Battery Company stands ready to guarantee storage-battery installations to take up the fluctuating load and regulate the speed of the prime movers until within 6 per cent above and below normal." What I did say was: "The Electric Storage Battery Company stands ready to guarantee the load regulation on the generators within 6 per cent on either side of the average." If this were done, it would mean that the load fluctuations actually falling on the prime mover would be not greater than 6 per cent on either side of the average, and if the load on the prime movers were held constant within this range the speed variation of the prime movers would be practically nothing.

Chicago, Ill. TALIAFERRO MILTON.

Field of the Operating Engineer

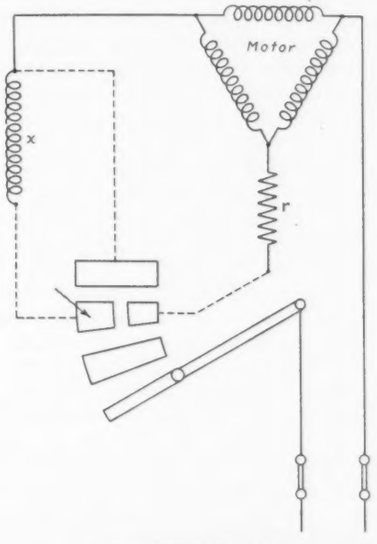
A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Economical Operation of Large Generating Units

In speaking of the results of operation as obtained by the Commonwealth Edison Company of Chicago, Mr. W. R. Wahl, of the Fisk Street station, recently presented some comparative data on the operation of the new 20,000-kw and 25,000-kw units installed in that station. Although these machines are very much larger than their 12,000-kw neighbors in the Fisk Street station, the increase in the number of operators attending the machines will not be in the same proportion. The number of operators does not increase in ratio with the kilowatt rating of the machines. As a matter of fact, the output, per man required for operating, increases from 40 per cent to 50 per cent.

Split-Phase Starter Troubles

It is the tendency of well-read but inexperienced electricians to look for serious causes of trouble when only a trivial cause may exist. In the absence of flashing



WIRING DIAGRAM

or smoking or other demonstration to indicate a short-circuit or burn-out, generator or motor trouble, as a rule, is due to some slight cause easily found by any questioning eye. The accompanying diagram indicates the connections of a three-phase motor operated from a single-phase circuit by means of a reactor-resistor split-phase starting box, of which x represents the reactance and r the resistance, both being inclosed within the body of the starting box. The motor had refused to start on moving the handle to the starting position. Some one knew that such a box included a resistance and a reactance and that the motor could not start if there was an open-circuit in either, but did not stop to think that a break in an easily accessible conductor in series with either would cause the same failure. Accordingly, before the inspector arrived the starting box had been taken apart and nothing wrong had been found. The panel, which contained the fault, was lying face downward upon the floor. On reassembling the box and connecting it in the symptoms were the same as in the first place. Noticing a little blistering on the contact marked with an arrow, the inspector discovered that the contact spring on the starting handle was gone.

Conditions Affecting Electrodeposition of Nickel

A paper on the "Electrodeposition of Nickel," by Messrs. C. W. Bennett, H. C. Kenny and R. P. Dugliss, presented before the American Electrochemical So-

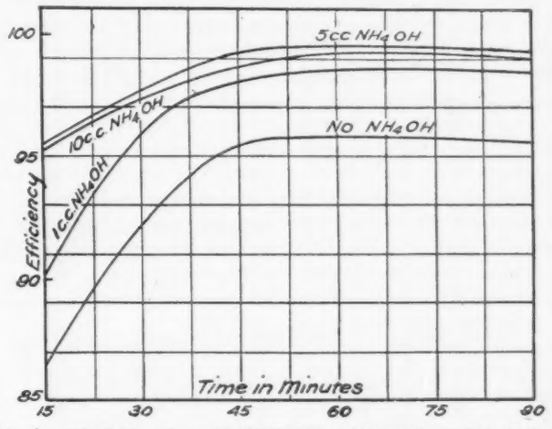


FIG. 1—EFFECT OF SURROUNDING CATHODE WITH ALKALI FOR NICKEL-PLATING

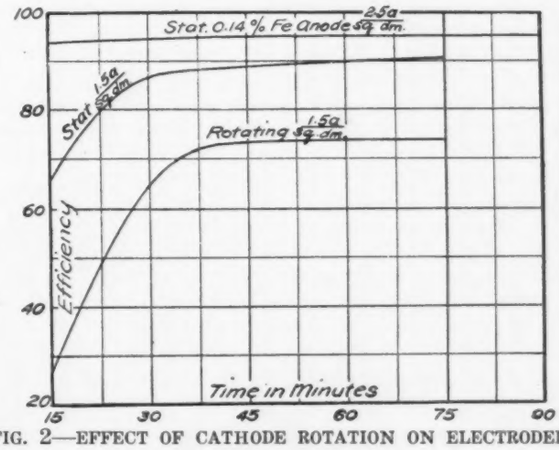


FIG. 2—EFFECT OF CATHODE ROTATION ON ELECTRODEPOSITION OF NICKEL

ciety's recent meeting in New York, pointed out that while stirring the electrolyte of a nickel-plating bath does not affect the efficiency of the deposition, rotating the cathode lowers it. In each case the iron deposit is increased, unless the cathode is placed in a porous cup containing an ammoniacal solution. The curves shown herewith indicate the effects on the efficiency of rotat-

ing the cathodes, employing a porous cup and increasing the concentration of the ammoniacal solution in the porous cup.

The following conclusions were arrived at: A good deposit of nickel can be obtained from the double sulphate if the solution at the surface of the cathode is kept alkaline. Since the rate of deposition is dependent upon the degree of alkalinity of the cathode films an initially high efficiency can be obtained and maintained by adding a definite amount of ammonium hydroxide to the solution to begin with. The alkaline film can be disturbed and the efficiency of the deposition thereby decreased by stirring the solution vigorously; the iron deposited on a rotating cathode is greater than that formed on a stationary electrode, and the iron content of the anode does not materially affect the efficiency of deposition.

Losses by Leakage of Steam

By R. T. Strohm

The efficiency of a steam plant cannot be brought to its highest value without looking well to the matter of loss by leakage, particularly the leakage of steam. Every pound of water that is converted into steam and then allowed to escape carries with it more than a thousand heat units, a part of which at least should have been utilized in driving pistons or doing other useful work. A certain amount of leakage of steam is bound to occur in every plant, but it is likely to be unnecessarily large if the proper precautions are not taken to prevent it.

The amount of steam that will escape in a given time depends on the size of the leak and the pressure of the steam. Therefore, the higher the steam pressure carried in a plant, the greater is the loss when a leak does occur and the greater should be the precautions taken to prevent such loss.

One of the most prolific sources of loss by leakage is to be found in valves and pistons that have become worn or that are not properly fitted. A certain engineer and designer of steam engines, in speaking of the relative economies of various types of engines, gave it as his conviction that the performance of the steam engine could be made far more creditable by simply taking precautions to prevent leakage, instead of spending so much time, thought and experiment in making changes in the valve gear, the location of ports, and so on. In other words, his statement implied that poor engine performance was not due so much to the effect of the valve gear on the steam distribution as to the effect of preventable waste by leakage.

Leakage of steam from the steam chest past the valve into the cylinder may be detected in different ways. If the leak is of considerable size, enough steam will enter the cylinder after cut-off has taken place to increase the pressure appreciably, and this increase will be manifested on the indicator card by a high expansion line. If the leak is very small, the change in the height of the expansion line will be so small that it cannot be differentiated from the rise due to re-evaporation. In such a case the indicator should be taken off, the piston moved near to one end of the cylinder and blocked in position. The indicator cock at that end should then be opened and the throttle valve slowly opened until full boiler pressure exists in the steam chest. If the steam valve leaks, steam will escape from the open indicator cock. The same test should be made with the piston at the other end of the cylinder.

A leak past the steam valve is of less consequence than a leak past the exhaust valve, because any steam that enters the cylinder past a poorly fitting valve will give up its energy by expansion in the same way as the steam entering during the admission period. But if the exhaust valve leaks steam escapes from the cylinder before its expansion is completed and thus wastes a part of its energy.

To test a slide valve for leakage on the exhaust side the exhaust pipe should be disconnected or a joint broken at some point in the pipe so as to open it to the atmosphere. Then the engine should be blocked with the piston in mid-position and the valve rod should be disconnected from the valve stem. Then, by moving the valve by hand, steam can be admitted to each end of the cylinder in turn and held there. If steam appears at the exhaust when the valve is not in a position to open either port to the exhaust, there is leakage through to the exhaust, either directly from the steam chest or past the exhaust edge of the valve.

If the engine is of the Corliss type, the piston should be set at the middle of its stroke and the engine should be blocked so that it cannot turn. The steam valves should be tripped and closed. The rod leading to one exhaust valve should be disconnected and the other exhaust valve should be set so as to close its port. Steam may now be allowed to enter the cylinder by moving the corresponding steam valve. Then the exhaust valve may be rotated slowly. If there is any leakage past the valve while it covers the port, steam will appear at the open end of the exhaust pipe. The same test should be applied to the other valve.

Piston rings may wear and break, and cylinders may be worn out of round, so that steam will escape from the working side of the piston to the exhaust side. If the leakage past the piston is large, it may be detected by the use of the indicator. The expansion line will fall too rapidly—that is, lie close to or below the theoretical expansion curve. Of course, if the steam valve should leak at the same time and at approximately the same rate, the indicator would fail to show the leak. But it is unlikely that this coincidence will exist.

The existence of a leak past the piston may be discovered without the use of an indicator, however. The cylinder head should be removed and the piston blocked in mid-position in the cylinder. The steam valve leading to the head end of the cylinder should be closed and the exhaust valve at the crank end closed. Steam is then admitted to the crank end by opening the steam valve at that end cautiously. If there is any leak past the piston, steam will escape from the open end of the cylinder. The same test should be made with the piston blocked in other positions in its stroke, as the leak may occur at some particular position of the piston.

Another way in which steam may leak from the engine is at the stuffing-box surrounding the piston rod, owing to a badly packed rod, poor packing material or a damaged rod. A leak at this point will be manifested by the hiss of escaping steam and by puffs of vapor.

Still another source of loss is leakage from the boiler and the steam pipes, due to bad joints. In the case of steam pipes the leak can be detected by the sound of the escaping steam or by the appearance of the vapor. If there is a leaky riveted joint in the boiler, the steam may escape inside the setting and be carried away unnoticed in the flue gases. It is possible to test for leakage at the stop valves, pipe joints and other outlets by shutting down all engines and pumps that use steam from the boiler, maintaining the normal pressure for a time, and noting whether there is any change in the water level. As no steam is being used, the water level should remain unchanged. If it falls, there must be some escape of steam. In making a test of this kind the pressure must be kept at the usual working point; for the water level always falls when a boiler is

banked and the pressure is decreased, because of the natural contraction of the water due to the lowered temperature. When the pressure is maintained the only cause of a lowered water level is leakage. Moreover, the test must be sufficiently long. It will require considerable time for a small leak to affect the water level in a boiler; therefore the level should be noted very accurately at the beginning of the test, and the test should be continued until the existence or absence of leaks is assured.

A lowered water level in a test like the foregoing may be due to a leaky blow-off valve or cock. If the blow-off pipe is arranged in such a way that the discharge end can be seen, it is a simple matter to determine whether any water is escaping when the valve is closed. But the blow-off pipe is frequently arranged to discharge into a sewer or some other form of underground drain, and the end of the pipe is hidden. In such a case the cock may be tested for tightness by noting the temperature of the blow-off pipe a short distance beyond the cock. The piping from the boiler to the blow-off cock will be hot, because it contains heated water. The cock itself and the piping directly connected to it will be heated by conduction. But at a distance of a couple of feet from the cock the blow-off pipe should be comparatively cool when the cock is closed and not leaking. If there is a leak, the escaping water will make the whole pipe hot.

In many power plants the condensation resulting from loss of heat in the steam pipes is led to a steam trap and is discharged into a hot well or into a feed-water heater. The purpose of the trap is to open intermittently and discharge the collected condensation but to prevent the escape of steam, and this is accomplished in a variety of ways, as by floats, buckets, or expansion devices. If, through incorrect adjustment, wear of the valve or failure of any of the parts, the trap is kept open continuously, there will be a steady waste of steam. And if the discharge pipe of the trap cannot be observed readily, the leakage is apt to continue for a long time unnoticed. It is not likely that any one could determine by observing the temperature of the discharge pipe whether water or steam was passing. But it would be possible for an experienced ear to detect, by the sound of the discharge, whether water or steam was escaping.

Saving 1 Lb. of Coal per Kw-Hr.

Suspecting that one of the 250-hp boilers in the station of the Poplar Bluff (Mo.) Light & Power Company was not performing its full duty, Mr. F. M. Wilkes, manager for the company, determined to conduct an investigation. No flue-gas analyzing outfit being at hand, an ingenious device was resorted to for ascertaining the performance of each unit. Into a small hole drilled in the rear wall of the boiler setting just below the line of the lower tubes a small iron rod was inserted and allowed to extend a short distance under the boiler. With perfect combustion the rod melted away at the end and finally broke off at the wall, while with the combustion only fairly good the rod became white-hot and sparkling. When, however, there was a large percentage of the gas passing up the stack and air was coming through the grate in excessive quantities, the rod remained black or dull red.

Prior to these tests both boilers were operated at Poplar Bluff, but with the discovery that one unit was carrying practically all of the load, operation of one of the boilers was discontinued, with a consequent saving of approximately 1 lb. of coal per kw-hr.

Increasing Boiler-Room Efficiency

A plea for better wages and a better grade of men in the fire-room was presented by Mr. C. M. Rogers, Meridian, Miss., before the convention of the Mississippi Electric Association recently. A prosperous management can well afford, he asserted, to pay $125 to $150 a month to its fire-room foreman, who has the handling of thousands of dollars' worth of coal. In some progressive stations rates as high as 45 cents per hour are paid fire-room employees in order to attract good men.

The careless or ignorant fireman will often put on twice as much coal as is needed, usually piling it near the front of the grate while the sides and edges are relatively thin. By leaving holes in the fire-bed or allowing doors to remain open unnecessarily he also lets an excess of air go through the boiler, reducing the temperature of the flue gases. If holes are discovered in the setting, these should be patched and the brickwork treated with a special paint.

Each quality of fuel used requires its own special draft values. An average allowance for run-of-mine bituminous coals is 0.01 in. of water column for each pound of coal fired per hour. Thus two 500-hp boilers having 160 sq. ft. of grate area and burning 3200 lb. coal per hour would be consuming 20 lb. of fuel per sq. ft. per hour and would require a draft of $(20 \times 0.01 \text{ in.}) = 0.2$ in. In most cases one will find the draft actually used to be from two to five times that really required.

The effect of scale and soot in lowering efficiency must not be overlooked. For example, said Mr. Rogers, $\frac{3}{8}$ in. of soot is equal in thermal insulating properties to 1.5 in. of asbestos covering, such as is used for lagging steam pipes. Scale is, of course, a better conductor of heat than soot, but the presence of even a thin coating will seriously affect boiler efficiency.

Induction Machine as Generator and Motor

On page 812 of your issue for April 11, 1914, you published an article entitled "Hydroelectric Plant with Induction Generator Operating Without an Attendant" which interested me greatly, as I have a development that could be carried out along similar lines, and I wish to obtain a little further information on the subject. What happens when the water gets low enough to allow the speed to drop below synchronism? Would the breaker open and drop off the line automatically or would the other generators become overloaded? The induction generator is brought up approximately to synchronous speed and then the switch is closed. Is this done by means of synchronizing lamps? When the speed is increased above synchronism the generator takes its share of the load, I presume. How much overspeed is necessary for full load? Is the load determined by ammeter readings on the induction generator panel? Could a 220-volt, three-phase machine be used through a transformer bank as well as a 2300-volt motor? C. D.

The induction machine operates at all times as motor with a load which is either positive or negative according to whether the speed of the rotor is below or above synchronism. When driven by the waterwheel the rotor accelerates to a speed somewhat above synchronism and the load takes on a negative value which is less than the power exerted by the waterwheel by reason of the losses in the induction machine. The machine can either be brought up to speed purely as an induction motor or it may be accelerated to approximately synchronous speed—either above or below—by the waterwheel and connected into circuit without using synchronous lamps. A polyphase wattmeter, or its equivalent in single-phase wattmeters, may be used to show the load—positive or negative—on the induction machine, but ammeters are useless for this purpose. When the voltage of the machine differs from that of the system, transformers or auto-transformers can be employed for connecting the one to the other.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

High-Tension Transformers with High Reactance.—A note on a recent British patent (No. 18,663, 1913) of the British Thomson-Houston Company and the General Electric Company of this country. In place of the laminated iron strips before used, a flat strip is wound in a spiral, directly over the secondary winding of the transformer. This device is found to give a straight-line reactance from no-load to full-load, while at the same time great mechanical rigidity is obtained. —London *Elec. Eng'ing*, May 14, 1914.

General Transformer.—J. Sumec.—A brief mathematical article, illustrated by diagrams, on the transformation ratio and currents in the general transformer with reference to a former article by the same author on the design of single-phase commutation motors.—*Elek. u. Masch.* (Vienna), May 17, 1914.

Lamps and Lighting

Tungsten.—A note on a recent British patent (No. 6911, 1913) of O. Voigtländer. A mixture consisting of 60 per cent tungsten trioxide and 40 per cent aluminum is placed in a crucible and burned in a strongly heated furnace. A current of inert gas is passed through the crucible during the process. Pure, homogeneous tungsten is obtained.—London *Elec. Eng'ing*, May 21, 1914.

Generation, Transmission and Distribution

Electromagnetic Hammer. — L. Schueler. — While electric drive of all kinds of machine tools makes rapid progress, smaller hammers, like riveting hammers, are almost generally operated by compressed air. Operation by electricity is possible with the direct use of the tractive force of an electromagnet for the production of the hammer blow. But the difficulty has been that the excitation circuit must be interrupted after each blow, whereby destructive sparks are formed. The author uses the following method: Only the hammer blow is produced by electromagnetic means, and after the blow is over the armature of the electromagnet is carried back to its first position by the action of a spring. In order to make this possible twice as much time is allowed for the return movement of the armature as for the blow. At the beginning of a period when the rising emf wave passes the zero point the circuit of the hammer is closed by means of a slip-ring segment on the axle of the generator. The magnetic field is produced, the blow of the hammer follows, and the magnetic field is brought back to zero again. This will be the case approximately at the close of one cycle. The slip-ring segment then opens the circuit without a spark, and the circuit is kept open during the next two cycles, during which the armature is brought back by the spring to its initial position. The circuit is closed again at the beginning of the fourth cycle and the succession of operations repeats itself. For each hammer blow and return movement three cycles of the current are, therefore, used, so that if the hammer is operated by means of alternating current of fifty cycles per second the number of hammer blows is sixteen and two-thirds per second, which agrees well with the usual practice of compressed-air hammers. The design of the hammer is shown in Fig. 1 in two sections. It will be seen that the excitation coils are at the right and left of the moving armature. The central piece between the two excitation coils consists of two halves, of which the upper one represents the movable armature of the electromagnet, the spring which brings this armature back to its initial position being clearly shown in the illustration. The lower half of the central piece is stationary and hollow so that the hammer blow can be transmitted downward. The design of the electromagnet permits exact calculation. The calculation is given in some detail and two appendices are added on the effect of the stray field and of the iron losses.—*Elek. Zeit.*, May 14 and 21, 1914.

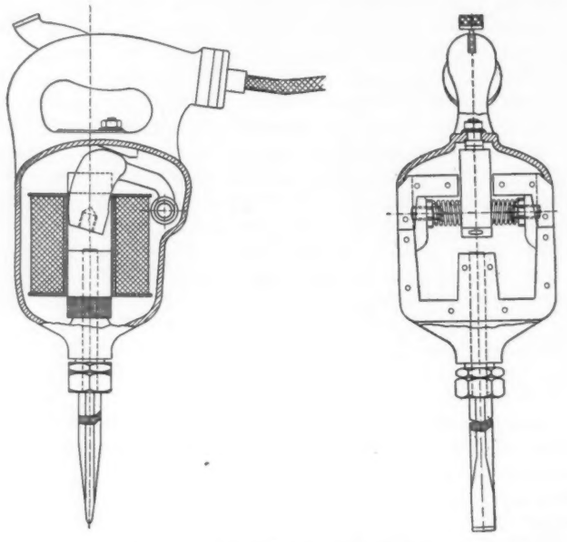


FIG. 1—DESIGN OF ELECTROMAGNETIC HAMMER

Electric Drive of Rolling Mills.—L. Rothera.—A paper on the application of electric drive to existing rolling mills, read before the (British) Institution of Mechanical Engineers. The author considers the conditions which render the application of the electric drive to rolling mills desirable and the methods in which the drive may be best applied. Questions of economy, improved output, space and greater use of existing plant are also dealt with.—London *Electrician*, May 22, 1914.

Rolling-Mill Machinery.—H. Wintermeyer.—A summary of the principal types of modern German electric rolling-mill machinery.—*Elek. Kraftbet. u. Bahnen*; translated in abstract in London *Electrician*, May 2, 1914.

Condensers.—A. Josse.—The first part of a paper, illustrated by diagrams, read before the German Association of Electrical Engineers on the present status of condenser systems in connection with steam-turbine plants. Modern condensation systems must fulfil the requirements of a high vacuum and of a high specific capacity of the surface condensers—that is, small di-

mensions—and the auxiliary machines must have no reciprocating motion. The author discusses the principle of air suction by means of water or steam injectors and discusses the different systems based on these principles. The paper is to be concluded.—*Elek. Zeit.*, May 21, 1914.

Installations, Systems and Appliances

Feeder Protective Gear.—An illustrated article on the Ferranti-Waters feeder protective gear recently demonstrated in London. Should a fault occur on any one of the feeders working in parallel, that feeder is immediately cut out of circuit, leaving the unimpaired feeder or feeders to continue the supply. The operation of the system is independent of any pilot leads or split conductors, and certainty of action is irrespective of the position of the fault. Fig. 2 shows the arrangement adopted for demonstrating the capabilities of the apparatus. Energy was supplied from the St. Marylebone power house in Richmond Street at 6600 volts, three-phase, through the Manchester Square substation to the Rathbone Place substation. Artificial faults were put on the system in the way shown. The arrangement of the protective apparatus is shown diagrammatically in Fig. 3. At the central-station end are two series transformers, one in each of the feeders in parallel. These series transformers (which are shown in Figs. 3 and 4) each have two secondary windings. One pair of secondaries is coupled in opposition and in series with one coil of a relay. The other pair is coupled "in assistance" and in series with a second coil in the relay. This instrument is an ordinary reverse-power relay (Fig. 5) in which the voltage coil is replaced by a current coil. When this relay operates it completes the trip-coil circuit of an oil switch in one or other of the feeders in question, cutting out from the power-house end the faulty cable. The current transformers are of the simple-ring type, and slip over or are built around the complete cable, leaving the armoring, etc., untouched. Assuming now a three-phase system with the neutral point earthed, under all normal conditions, the vector sum of the currents in the cables being zero, the series transformers are unaffected. When a fault occurs the return of current via "earth" upsets this condition, thereby inducing emfs in the secondary windings. If the fault has occurred beyond the section in question, this condition of unbalance will be equally shared by all the cables in parallel, in which case no current will flow from the secondaries in opposition since the emfs will be equal and opposite. If, however, the fault occurs on feeder No. 1, a greater proportion of current will flow through it than through the others. This induces a higher emf in the corresponding series-transformer secondaries, which means that the secondary winding corresponding to No. 1 feeder will overcome that corresponding to No. 2, which is connected in opposition. This causes the current to flow through one coil of the relay. Current will also flow in the other secondaries since they assist each other; thus currents of certain definite phase relation flow through the two coils of the relay, causing it to operate in a certain direction. If now the fault be on No. 2 feeder, the current in the opposing secondaries will be reversed, but the current in the "assisting secondaries" will remain unchanged in sign. This, of course, causes the relay to operate in the other direction. If there is no alternative path (as in the case demonstrated at St. Marylebone) another arrangement is provided for the substation end. In this case the relay (Fig. 6) includes a voltage coil, this coil being connected across the remaining two phases of the system to the particular core of the feeder on which the current coil works. As long as the system is operating normally there is a balance between the two current coils and the relay does not tend to operate. When a fault occurs the current in the faulty feeder reverses. The emfs of the two relay transformer secondaries being now "in assistance," current flows through the current coils of the relay. Under this condition, these two coils repel each other and, being on a dead center, are in a state of unstable equilibrium. The effect of the voltage coil is to hold one current coil against its stop and to force the other away. This is the controlling force for an instant only, for as soon as one current coil has moved off the dead center the repelling action of the other current coil completes the movement with a certainty proportional to the severity of the fault, even though the voltage of the system fall to zero.—London *Electrician*, May 22, 1914.

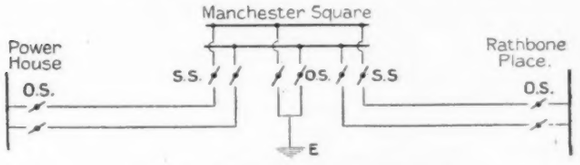


FIG. 2—WIRING ARRANGEMENT

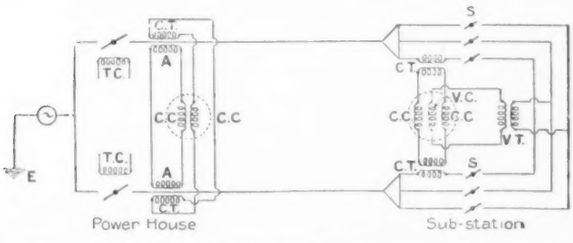


FIG. 3—ARRANGEMENT OF PROTECTIVE APPARATUS

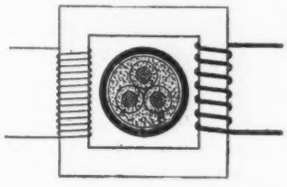


FIG. 4—FAULT CURRENT TRANSFORMER

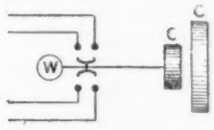


FIG. 5—RELAY FOR SUPPLY END

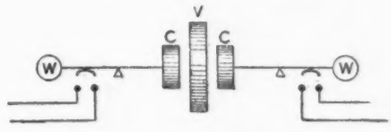


FIG. 6—RELAY FOR POT-END FEEDER

The Problem of Isolated Plants.—WALTER STRAUSS.—In the last year German central stations have succeeded more and more in inducing larger consumers, especially factories, to buy electricity in bulk from central-station plants. The author discusses under which conditions it is of advantage for a factory to buy energy from a central station instead of erecting an isolated plant. Calculations of the cost of operation are given for three factories, one with a maximum power consumption of 15 kw, the second 110 kw, and the third 400 kw. The assumptions of the calculation are given and the yearly cost of operation is determined for isolated plants with different prime movers

and for buying the energy from a central station. The results of the calculation are given in tables and are represented in diagrams and show that in very many cases it is best to buy the energy in bulk instead of erecting an isolated plant. The paper is to be concluded.—*Elek. Zeit.*, May 21, 1914.

First Cost of Central Stations.—EMIL SCHIFF.—The author discusses sources of error in figuring the first cost of central stations per unit of rating. The rating of the storage batteries should be taken into consideration, but the amount of energy bought in bulk from other stations is not to be considered. The method of calculation of the first cost in different stations is not the same. If the first cost of all the machines installed in the course of time is summed up, it should be compared with the aggregate rating of all the machines installed, not with the rating of the equipment available at the present time. The author shows that there are uncertainties in calculating the first cost which may cause errors of from 50 to 100 per cent. By defining exactly what is meant such errors can be avoided.—*Elek. Zeit.*, April 23, 1914.

Storage-Battery Booster System.—An illustrated description of an installation of a battery with automatic booster in a direct-current three-wire system. The Cuneod regulator is used, which consists essentially of an electromagnetic balance with damped movement. The action of the regulator is described in detail, and wiring diagrams of regulator, battery and generator connections are given.—*La Revue Elec.*, May 1, 1914.

Rheostats.—L. CACHOT.—The first part of an illustrated article giving a systematic review of different types of starting rheostats and speed-regulating rheostats for direct-current motors.—*La Revue Elec.*, May 1, 1914.

Electrical Accidents in Mines.—K. SCHROEDER.—A careful analysis of the accidents which occurred in mines in Prussia in 1912 and of the reasons which caused them. There were sixty-nine accidents, of which forty were fatal. Protective devices are recommended to prevent accidents from contact with the trolley wire. —*Elek. Kraftbet. u. Bahnen*, April 24, 1914.

Municipal Versus Private Ownership.—K. PIETZSCH. —The author doubts whether the general public has a greater interest in seeing an increase of the number of private electric stations than in properly conducted municipal plants.—*Elek. Zeit.*, May 14, 1914.

Rates.—Some data on rates of eighteen German central stations with special low rates for lighting at late night hours for restaurants, hotels, etc.—*Elek. Zeit.*, May 14, 1914.

Wires, Wiring and Conduits

Manufacture of Impregnated Cables.—E. MASSON.—The author speaks of a "crisis" in the manufacture of impregnated paper cables. This "crisis" is not a commercial one but rather of a technical nature. It is declared that some of the cables made by some manufacturers occasionally fail in a most unexpected way, and that in spite of long investigations the exact cause for these failures has not been determined. The author reaches the conclusion that it is the method of impregnation which is defective, not the insulating material. It appears that the papers commercially obtainable at present are more difficult to impregnate than were the papers some years ago. Whenever the maker succeeds in impregnating the paper the results are as good as ever. Even in cables which fail there are sections which are perfect and in which the paper is well impregnated. It is not only necessary to impregnate the paper with the insulating material, but it is also necessary to expel the humidity. Cable manufacturers seem to assume in principle that if they put their cables in a vacuum for twenty-four, forty-eight or seventy-two hours at a temperature of 160 deg. C. the humidity will surely be expelled. This the author considers to be an unproved assumption. Further, if the paper is heated too much it is dried but becomes unable to absorb the impregnating material. The question is whether it would be better to expel the humidity first or to fill the paper first with impregnating material. There is a vast field for systematic research here, and the author gives some hints as to how to proceed. As to tests of finished cables, he proposes that a 5000-volt cable should be tested for one-quarter of an hour with 20,000-volt alternating current and then for five minutes with 50,000-volt direct current. These tests, he is sure, would give the needed guarantee.—*La Revue Elec.*, May 15, 1914.

Electrophysics and Magnetism

Magnetic Properties of Ferro-Magnetic Mixtures.—C. BENEDICKS.—A brief note on a paper read before the (British) Iron and Steel Institute. Magnetic measurements were carried out on ferromagnetic, mechanical mixtures of magnetite (with quartz), iron (with copper) and nickel (with copper), the latter pressed together into solid bars. They proved, in agreement with older measurements, that the magnetic intensity shows a very distinct deviation from a rectilinear relation, depending on the concentration. This is an experimental verification of a previous theoretical curve of the author's, which serves, at least on broad lines, to explain how the assumption of one gradually occurring molecular change (the increased presence of gamma-iron with rising temperature in the alpha-iron) can agree with the falling of the magnetism within a certain interval.—London *Elec. Eng'ing*, May 21, 1914.

Units, Measurements and Instruments

Electrolytic Meter.—H. STAFFORD HATFIELD.—In 1905 S. H. Holden proposed the use of an electrolytic hydrogen meter constructed as shown in Fig. 7. A hermetically sealed glass tube has two thin platinum plates, *A* and *C*, sealed into it with electrical connection through the glass to the outside. The tube contains a solution of dilute acid in water (say, sulphuric), and in the remaining space hydrogen gas at about atmospheric pressure. The electrodes *A* and *C* are coated with platinum black which is saturated with hydrogen and are, therefore, so-called "hydrogen electrodes." The cell is connected in parallel to a low-resistance shunt *S* and in series with a high resistance *R*. When a current is passed through the cell hydrogen disappears at the anode *A*, going into the electrolyte, and an exactly equal amount is liberated at *C*, and should, it was supposed, appear in bubbles and ascend into the measuring tube *B*, giving a measure of the ampere-hours passed. No chemical work is done. The condition of proportionality was, however, not fulfilled in practice. The trouble was not in the anode but in the cathode, and the present author has found that the trouble is due to the over-voltage required to deposit gas bubbles on the cathode. He has developed a new form of cathode which is shown in Fig. 8 and corresponds in a greatly enlarged scale to the part marked *C* in the preceding diagram. *A* is a small glass thimble, closed by a grating *B*, the holes in which are not more than 0.1 mm or so in diameter. The grating is of blackened platinum and connected as cathode. The space inside the thimble is filled with hydrogen, which remains thus held by the grating, since the difference in hydrostatic pressure between the top and bottom of the grating is not enough to overcome the capillary pressure at the top of the same.

The capillary pressure is, however, very small, being about 1 cm of mercury, and corresponds to a very small supersaturation of hydrogen ("about four-thirds of 1 per cent of 2 per cent = 0.026 per cent of the volume of the liquid"). When a current is passed, the gas deposited diffuses instantly into the gas space. Experiment shows that none is lost within the limits of load

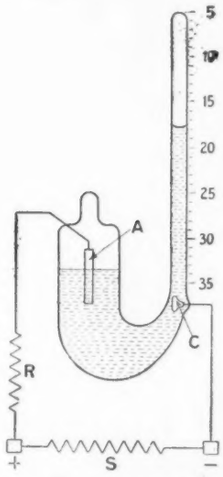


FIG. 7 — DIAGRAM OF METER

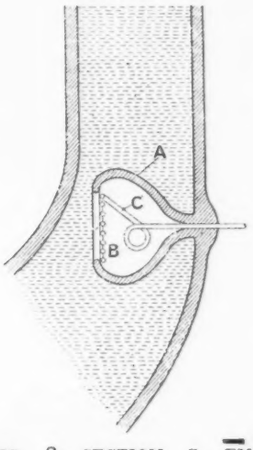


FIG. 8—SECTION C, ENLARGED

required in practice. The gas in the thimble increases in volume and finally pushes a bubble out through the largest hole in the grating. These bubbles ascend into the reading tube, each being only a fraction of a scale division, so that no discontinuity is observable. The apparatus is now working perfectly, but instead of platinum black the author now uses gold coated with rhodium black and phosphoric acid as electrolyte. One of these pieces of apparatus has been running for some months and subjected to heat tests, and has caused no trouble whatever. The readings are almost independent of the temperature, although they increase with rise of temperature to a very small extent and diminish to the same extent with fall of temperature. The instrument is useful as a voltameter or as a house-service meter.—London *Electrician*, May 22, 1914.

Single-Phase Meter.—An illustrated announcement of the Reichanstalt by which a single-phase induction meter of the A. E. G. is admitted for calibration. The construction is described and illustrated, together with the principle of operation and the methods of calibration. The principal element is an induction motor, the armature of which consists of a thin metallic disk and is acted upon by two fluxes, one being proportional to the voltage and the other to the current. In order to give correct readings with inductive loads the two magnetic fluxes are exactly in time quadrature when the voltage of operation and the current are in time phase. —*Elek. Zeit.*, April 30, 1914.

Measuring Power.—PESTARINI.—A brief illustrated paper read before the International Society of Electricians in Paris on a method of measuring the real power and the wattless power in an alternating-current circuit.—*La Revue Elec.*, May 1, 1914.

Telegraphy, Telephony and Signals

Wireless Telegraphy. — H. DIESSELHORST. — The author first gives a concise summary of the present status of wireless telegraphy and then discusses more in detail certain specific problems. He deals with the different systems of excitation, with frequency transformation, propagation of waves and the effect of the atmosphere, the method of operation, use of earth antennas, and finally discusses new receiving methods and atmospheric disturbances.—*Elek. Zeit.*, May 14 and 21, 1914.

Miscellaneous

German Association of Electrical Engineers.—The next annual meeting will be held in Magdeburg from May 24 to 28. The secretary's report, signed by G. Dettmar, states that the number of members has increased by 725 during the last year and is now 6011. The association includes within itself twenty-two local electrical societies, of which the Electrical Society of Berlin, with 1960 members, is the largest. A review is given of the work of the different committees during the past year.—*Elek. Zeit.*, May 21, 1914.

Book Reviews

MASCHINEN UND APPARATE DER STARKSTROMTECHNIK. IHRE WIRKUNGSWEISE UND KONSTRUKTION. By Gustav W. Meyer. Leipzig, Germany: Verlag von B. G. Teubner. 590 pages, 772 illus. Price, 15 Marks.

An excellent treatise on machinery for the electrical generation, transport and distribution of energy. The illustrations and diagrams are numerous and well selected. The treatment of the subject in the text is also clear and direct. The book is divided into six sections, dealing respectively with direct currents, direct-current generators, direct-current distribution systems, alternating currents, the transformer, and electric energy transmission by alternating currents. An excellent index with bibliographical list is appended. The matter is so treated that the book may be used either as a textbook in technical colleges or as a reference textbook for students in practical work. The book will be of interest to all who desire to familiarize themselves with German electrotechnical practice in energy generation and distribution.

FACTORY ORGANIZATION AND ADMINISTRATION. By Hugo Diemer. New York: McGraw-Hill Book Company, Inc. 378 pages, 174 illus. Price, $3.

This interesting book contains much suggestive matter. It is a sort of primer, to be placed in the hands of students who are entirely unfamiliar with industrial problems and with the questions arising from the building and organizing of industrial plants. Such student will obtain much useful information which he may later check up against practical experience. Book knowledge in matters of the sort with which this work deals is, perhaps, somewhat dangerous. It is true enough that the faults of children are much more apparent to the spinster, who also is apt to underestimate the difficulties and obstacles encountered by parents in improving the process and methods of bringing up their offspring. The practical men in the industries of today are continually being told by men engaged in teaching or law that their processes are uneconomic and wasteful, and that they could be and should be changed to advantage. Such advice is always worthy of careful attention, but it figures without consulting the host, namely, the inefficient workingmen and assistants with which modern industry abounds. The book before us is full of data covering such subjects as "organization and control," "factory accounts," "factory location," "the general office," "the order department," "the drafting department," "the pattern department," etc. The concluding chapters deal with "Rate Fixing and Time Studies" and "Principles Underlying Good Management."

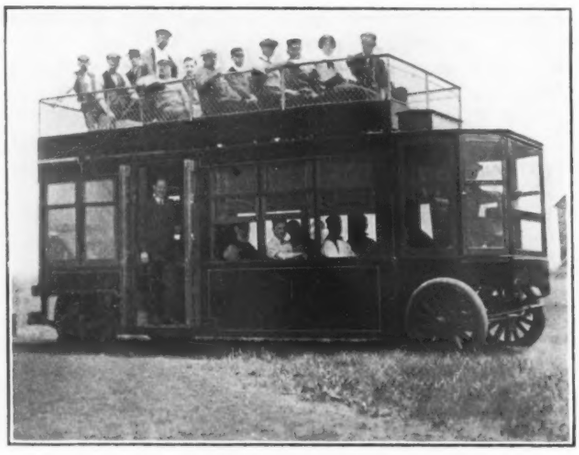
New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Stepless Electric Omnibus

A stepless, double-deck electric omnibus has been developed by the Field Omnibus Company, New York, with the co-operation of the New York Motor Bus Company. This bus has a seating capacity of thirty-eight passengers, eighteen on the lower deck and twenty on the upper deck. Its over-all length is 20 ft. 10 in., the height of the step from the ground into the car is 12.5 in., and the height of the roof from the ground is 7 ft. 8 in. Its height is 2 ft. 3 in. less than that of the motor buses now used in New York, Paris and London and the length is approximately 5 ft. less. No regular chassis is used, but the body, which is constructed of steel, is built up to fulfil the requirements of a chassis.

The rear wheels are mounted on an auxiliary truck which carries the driving machinery and which can be detached as a whole for examination and repair.



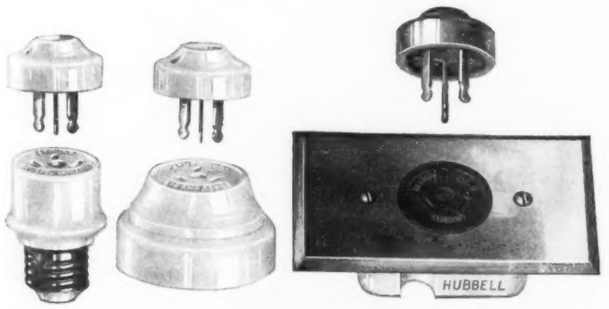
STEPLESS DOUBLE-DECK ELECTRIC OMNIBUS

An Edison storage-battery equipment of 100 cells furnishes energy to two 10-hp motors, driving by means of a universal-shaft internal gear and a spur pinion with a seven to one reduction. The front wheels are hung from the body by springs. The batteries are under the seats on the first deck and in a rear compartment under the stairway at the back of the door. The operator's cab is over the front axle and is equipped with a large railway-type controller with cut-outs for both motors, a safety switch, a charging plug, a circuit breaker, an ammeter and a voltmeter, and two sets of brakes. The energy for lighting is obtained from a separate battery.

This bus is designed for heavy public-service transportation and will, it is claimed, give a daily average mileage of 125 miles or more. It has shown, it is said, a speed on the level of 18 to 20 miles per hour, and on a 6 per cent grade of 10 miles per hour. The builders of this omnibus have also designed a stepless bus which is a modification of the omnibus described above. The body is made after the old-English coach style with the entrance on the side at the front end. The bus seats thirty-six and can be operated by one man.

Attachment Plugs and Receptacles

Three-wire attachment plugs and receptacles are being made by Harvey Hubbell, Inc., Bridgeport, Conn. In Fig. 1 is shown a separable attachment plug which is rated at 660 watts for 250-volt circuits. The cap



FIGS. 1, 2 AND 3—ATTACHMENT PLUG, WALL RECEPTACLE, AND FLUSH RECEPTACLE

for this plug is made entirely of porcelain or of porcelain with a brass cover. The wall receptacle shown in Fig. 2 and the flush receptacle in Fig. 3 are rated at 10 amp for 250-volt circuits. These plugs and receptacles are of the polarized type, making it impossible, therefore, to reverse the polarity. They may be used with electric stoves, portable motors, etc.

Bowl-Type Diffusive Reflectors

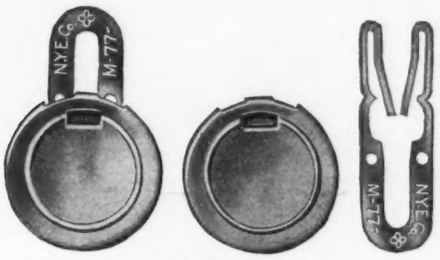
Steel reflectors of the bowl type designed to distribute uniform illumination over wide areas and to protect the eyes from glare have been placed on the market by Harvey Hubbell, Inc., Bridgeport, Conn. These reflectors are made in sizes ranging from 7 in. to 10 in. in diameter and are designed for lamps rated at from 40 watts to 250 watts. The reflectors are provided with either porcelain-enamel or baked-enamel-paint finish. A holder with a contractile collar made

BOWL-TYPE STEEL REFLECTOR

by the above manufacturer is used. This holder may be attached to any screw-base shell socket. The reflectors can also be fitted with a holder made by Harvey Hubbell, Inc., for porcelain sockets.

Meter Seal

An all-metal seal consisting of a seal disk and a hasp is shown in the accompanying illustrations. When the hasp is pushed home into the disk it catches in the interior and cannot be pulled out again without breaking the seal. Holes are provided in the hasp where it enters the disk so that the seal can be broken easily at this place without any tool. A small trade-mark or number, for purposes of identification, can be stamped on the hasp as shown in the illustrations. While primarily designed to protect watt-hour meters and service cut-out boxes, it can also be used in sealing instruments, cash-boxes, fare-boxes, registers, freight cars, etc. The seal is being made by the Metropolitan Engineering Company, New York.

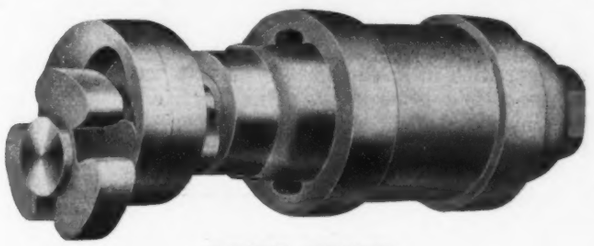


ALL-METAL SEAL

Turbine Cleaner for Fire-Tube Boilers

A "knocker-head" cleaner for dislodging scale from the outer surfaces of tubes in return-tubular boilers is shown herewith. It is driven by a turbine operating with steam or compressed air. This cleaner also removes the soot from the inner surfaces of the tubes. The soot is loosened by the vibrating knocker and is blown out of the tube ahead of the cleaner by the steam or air exhausting from the front of the turbine. The knocker-head is made in three parts—a cylindrical body somewhat smaller in diameter than the boiler tube, with an eccentrically pivoted lever carrying a clover-shaped knocker on a stud at its free end. The lever fits flush into a triangular recess in the forward face of the main body, the free end swinging in an arc through the center of the head. The three hammer faces of the knocker are shaped to fit the inner circumference of the boiler tube.

The head is driven at high rotative speeds. The eccentrically pivoted lever carrying the knocker is thrown from side to side and the knocker revolves on its axis at each contact with the tube. A gyratory motion is given to the knocker, causing it to hit all points of the interior circumference of the tube. The cleaner is fed into the tube by a flexible rubber hose which furnishes the supply of air or steam.

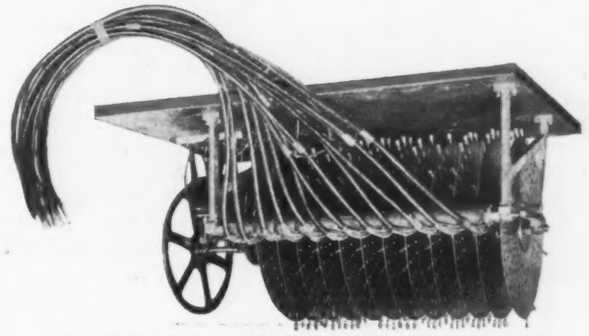


TURBINE CLEANER

The turbine for driving the head is of the rotary engine type. The air or steam strikes upon radial paddles, which are continually held out by the air or steam which is admitted into a chamber behind the paddles so that they always form a tight fit with the case. The turbine has four paddles, two of which are always under pressure, making it impossible for the motor to stall. This cleaner is manufactured by the Lagonda Manufacturing Company, Springfield, Ohio.

Flashing Window Signs with Unique Features

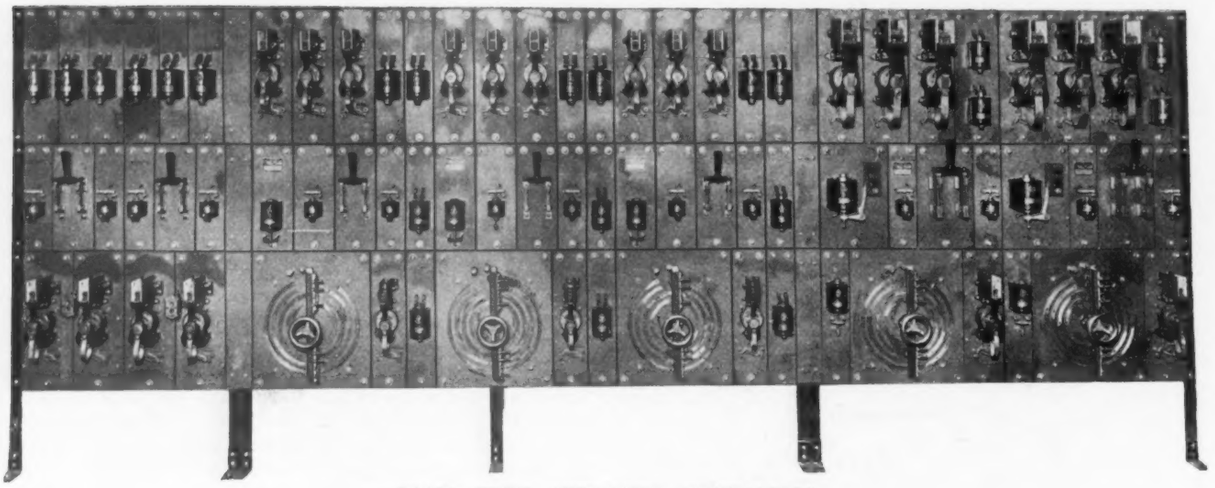
A window-display sign which automatically flashes several sentences or phrases successively has recently been placed upon the market by the E. B. Electric Sign Company, Inc., 209 North Jefferson Street, Chicago, Ill. On direct-current circuits the twelve 14-in. disks shown in the cut are driven by a 1/6-hp rotary converter which at the same time supplies alternating-current energy to a 250-watt transformer. The low-tension side of this transformer is connected to the small low-voltage lamps used in the sign. On alternating-current circuits a 1/32-hp motor is used to drive the disks, and energy for the lamps is furnished by a small transformer. Rotating on a common shaft, these disks are provided with thirty-two slots in which letter sticks may be inserted. As the disks revolve, these sticks make contact with an arm inserted between the disks, energizing the required number of lamps behind the sand-blasted glass cover to form the desired letter. There are 300 circuits leading from the flasher to the sign, and behind each letter plate, which is 3 in. high and 3 in. wide, are twenty-five small tungsten lamps. A portion of these are used to form each letter. The letter sticks are put into the disks of the flasher in much the same way that a printer sets up a line of type, and the manufacturer states that changes are easily made. With electricity at a 12-cent rate, a twelve-letter sign of this type can be operated for approximately 1.5 cents an hour.



ROTATING DISK WITH SLOTS FOR LETTER STICKS

Automatic Controllers for Steel Mill

A large automatic controller system is being installed by an Eastern steel company in its plant to increase the generator equipment without increasing the boiler equipment. Low-pressure steam turbines are to be used which will be operated from the exhaust steam of rolling-mill steam engines, etc., and to get the proper vacuum a large condensing plant is to be installed. The switchboard illustrated on page 1410 is for the control of the motors used in connection with this condensing plant.

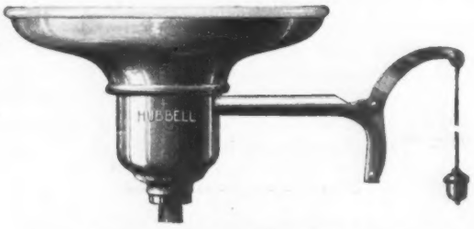


BOARD WITH AUTOMATIC CONTROLLERS

Beginning at the right-hand side of the switchboard, there are two automatic starters for two 125-hp motors with combined armature and field control for the motors driving the fans. In the center are three controllers of the same type for three 30-hp motors driving the pumps that circulate the cooling stream of water. The left-hand section contains two automatic motor starters for two 30-hp constant-speed motors driving the pumps which remove the water that has been condensed from the pipes. The entire operation is automatic and is said to be fool-proof. The running speed of the adjustable-speed motors is set by the hand wheels on the lower panels. When the starting push-buttons are depressed the motors accelerate to the speed determined by the setting of these regulators. If the supply of energy should fail and then come back on the line, the motors are automatically re-accelerated to their previous running speed. The equipment for this installation was made by the Electric Controller & Manufacturing Company, Cleveland, Ohio.

Ceiling Pull-Switch Rosette

The ceiling pull-switch rosette shown in the accompanying illustration is being manufactured by Harvey Hubbell, Inc., Bridgeport, Conn. The device is equipped with a large metal-covered shallow ceiling

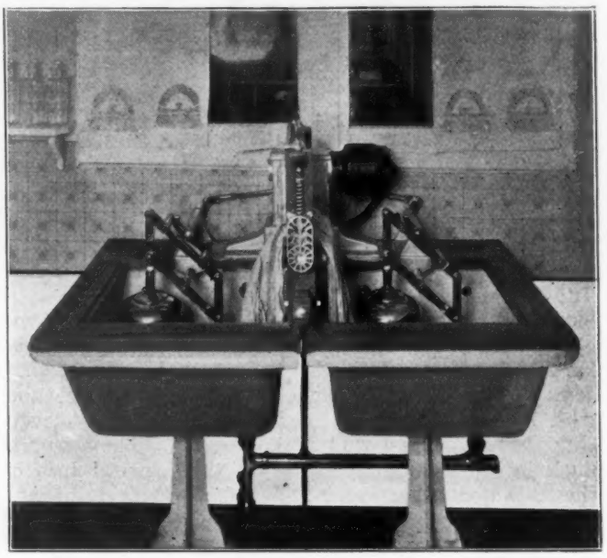


PULL-SWITCH ROSETTE FOR CEILINGS

base, and is designed for 3-in., 3.25-in. and 4-in. outlet boxes. The base of this rosette and of other rosettes similar in design is identical with the base of the standard wall sockets put out by the above manufacturer. The switch element is the same as that used in the pull sockets made by Harvey Hubbell, Inc. This rosette is furnished with an attachment called an "economy extender," the purpose of which is to extend the pull cord when used with a reflector.

Electrically Operated Vacuum Washer

An electric washing machine which cleans the clothes by means of air compression and suction is shown herewith. This washer is designed to be at-



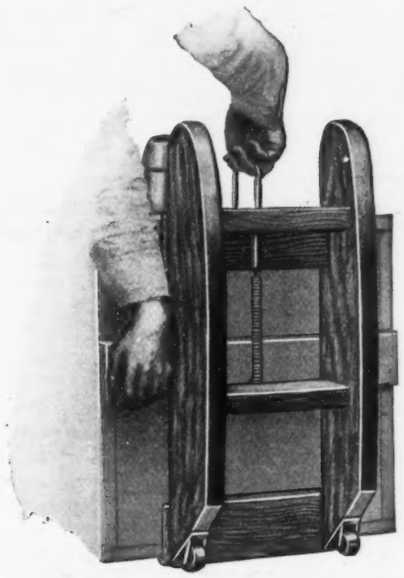
ELECTRIC VACUUM WASHERS

tached to twin stationary tubs of any size or make. The machine can wash, wring or rinse simultaneously or separately as desired. All parts of this washer are accessible and are easily removable; they are also interchangeable. All the rapid-moving parts are incased in oil. The machine is operated by a small motor of the inclosed type. It is equipped with a ball-bearing wringer with inclosed gears, reversible water-board and quick-safety-release lever. This electric washer is being manufactured by the Arora Company, Inc., 501 Fifth Avenue, New York.

Carboy Rocker

A carboy rocker equipped with small truck casters is shown herewith. With this rocker one man can load and move a full carboy flask to any desired place and entirely empty it without spattering the contents on his hands, face, clothes or the floor. The caster wheels

make it easy to move the heavy flasks around from place to place without lifting them on or off hand-trucks with the attendant danger of breaking. The rocker can be attached to a carboy flask or changed from one flask



ATTACHING ROCKER TO CARBOY FLASK

to another in a very short time. A vent tube used in connection with the rocker makes the flow of liquid uniform and free from bubbles and spattering. The rocker is made of wood and weighs 11 lb. It is manufactured by the Munning-Loeb Company, Matawan, N. J.

Adjustable Electric Searchlamp

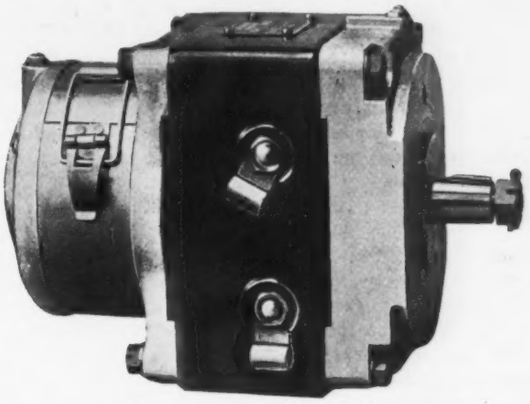
An electric searchlamp which can be fastened readily to an automobile windshield within easy reach of the driver is being placed on the market by the Wood Manufacturing Company, Fairfield, Conn. The lamp can be turned in any direction and will stay locked at whatever

ELECTRIC SEARCHLAMP

angle it is placed. The driver can read signs at the side of the road, light the step of the car and even illuminate the road at the rear when driving backwards while turning. The switch is made integral with the handle.

Electric Equipment for Automobiles

The 6-volt starting and lighting equipment, consisting of generator, starting motor and switch, voltmeter and junction boxes, made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has been adopted by the Locomobile Company of America for its 1915 model automobiles. In the accompanying illustration is shown the starting motor used in this equipment. The lighting generator is of the differentially wound, self-regulating type and is designed to

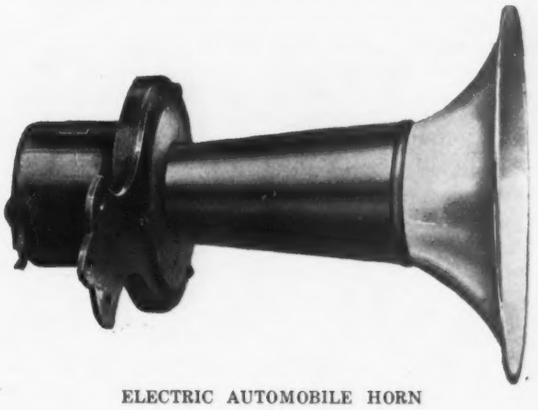


STARTING MOTOR FOR AUTOMOBILE

operate at low speeds. The starting motor is of the series-wound type and is designed for high-starting torque. A flush-type voltmeter indicates the condition of the battery at all times. The lettering on the voltmeter scale is white on a black background. By using junction boxes all the wiring on the chassis and the body are centered at one point, thus facilitating the removal of the car body from the chassis. The connections for both the starting and the lighting systems are on single-wire circuits.

Electric Horn

An electric horn depending on magnetic vibrations for its sound-producing qualities is shown herewith. The device gives out a loud sound, which, the manufacturers claim, is not harsh or grating on the ears. It operates on 3 amp and is controlled by a push-button. The horn is made in two sizes, one with a 5-in. mouth and a length of 9 in. and the other with a 7.25-in.



ELECTRIC AUTOMOBILE HORN

mouth and a length of 10 in. It is finished in brass, nickel or black enamel. This horn is being placed on the market by the Automobile Supply Manufacturing Company, 220 Taafe Place, Brooklyn, N. Y.

Jobber, Dealer and Contractor

Pacific Coast Jobbers' Association

The regular quarterly meeting of the Pacific Coast Jobbers' Association was held at Hotel Del Coronado, Coronado Beach, Cal., May 28 to 30, with a good attendance, particularly from points in the southern part of California. Following the business sessions of the jobbers, which were presided over by Mr. H. V. Carter, president, and Mr. A. H. Elliot, secretary of the association, a joint meeting of jobbers and manufacturers was held on the afternoon of May 30. Considerable discussion was given to the Stevens bill, the general opinion of the body being in favor of it. Mr. Carter, in commenting on the bill, referred to the fact that many metropolitan chambers of commerce have already expressed themselves in favor of the proposed act, and he said he believed that its passage would result in a stable market for standard articles of merchandise. The California eight-hour law was also discussed. This law is to go before the Legislature in the fall of 1914. The general feeling was that the wording of the law as proposed is too drastic, and that the act would, if passed, be detrimental to the manufacturing interests of the State and manifestly unfair to such industries. A resolution was unanimously concurred in that those present would use their influence as far as possible to defeat the passage of the act.

On Friday evening a rejuvenation of the Jovian Order was held under the joint direction of Statesmen J. N. Colkitt and Alfred May. Twenty-three candidates were admitted into the order. The permanent degree team of Los Angeles conducted the ceremonies.

On Saturday evening a banquet was held. Mr. T. E. Berger presided as toastmaster and presented the cups to the winning contestants in the golf tournaments. Short speeches were delivered by Messrs. Carter, H. T. Matthew, R. D. Holabird, A. H. Halloran, Ralph B. Clapp and A. H. Elliot. Following the banquet the party adjourned to the ballroom, where dancing was indulged in until a late hour. This is the first convention of the Pacific Coast Jobbers to be held at Coronado, and it appears likely from opinions expressed by those in attendance that a return visit will be paid to the resort meeting place. The next meeting will take place at Del Monte in about three months.

Louisville Electrical Clearing House

Means of increasing efficiency in electrical work are being considered with much attention by the members of the local Electrical Clearing House Association of Louisville, Ky., which has recently promulgated stringent rules, such as the loop system for the wiring of houses, etc. These rules tend to increase the expense to the owner, and the members of the organization are seeking to find ways of giving the better service without the increased cost. Mr. Frank A. Good, electrical engineer with F. A. Clegg & Company, addressed the association on this subject at the last meeting, and the members also saw demonstrations of the best ways to insulate fixtures.

The influence of the Electrical Clearing House in Louisville is shown by the issuance as of the first of May of three revised rules applying to electric wiring. These rules are as follows:

In bathrooms, fixtures and drop lamps not controlled by switches must be equipped with porcelain key sockets or insulated pull-chain sockets. All alternating-current motors of over 1 hp must be equipped with double-throw spring switches with running fuses when not equipped with approved starters which have the above-mentioned protection. All concealed work must be wired on the loop system, with boxes at each outlet, except in front-porch ceilings. The order, issued to electrical contractors, was over the signatures of Messrs. E. J. Theobold and Gus Ansbach, city electrical inspectors, and Mr. E. L. Kopf, electrical inspector for the Kentucky Actuarial Bureau.

Classified Results of House-Wiring Campaign

During an old-house wiring campaign conducted from Nov. 21 to Dec. 24, 1913, by the Iowa Railway & Light Company in Marshalltown, Ia., an analysis was made of the results. Several classes of advertising mediums were employed, and after the closure of each contract customers were closely questioned to determine which type of advertising had excited their interest. Of course, this system does not give an absolute check on the value of advertising, because in many cases it is a combination of all advertising that induces the prospective customer to make inquiry. However, the accompanying table of results does show conclusively that the advantages of window-display advertising should never be neglected.

Contractors co-operating agreed upon a fixed price for wiring, and the central station paid all advertising and soliciting expense. Small boys were employed to distribute handbills and inquiry cards throughout the city, and it was on the return of these cards and from information given by the company's employees that the "prospect" list was formed. Although the contractors agreed to allow customers to make partial payments on wiring accounts, extending over five months, more than 50 per cent of the business was settled on a cash basis or paid within thirty days.

Advertising during the campaign was confined exclusively to the bargain in wiring, the price being $22.50 for any four rooms, including wiring, two two-lamp fixtures, two drop cords and a lamp for each fixture. Mr. Charles Munson, local manager of the Iowa Railway & Light Company at Marshalltown, was in personal charge of the campaign and the collection of the accompanying

HOUSE-WIRING CAMPAIGN DATA

Total residence wattage since Nov. 21 34,285
Total contracts given to contractors 91
Total amount of contracts $2,431.40

Division of contracts according to different means used in getting customers:

	Per Cent	Watts	Amount
Through window display	30	8829	$729.30
Through handbills	10	2943	243.10
Through newspapers	10	2943	243.10
Through office employees	10	2943	243.10
Through outside employees	10	2943	243.10
Through personal canvass	15	4420	364.65
Through neighborhood canvass	10	2943	243.10
Through street-car advertising	5	1471	121.55

Total number of cards received in office	65
Number of "prospects" on cards secured as customers	35
Number of residences outside of limits of lines now erected or residences where new extensions would have to be built	13
Number of cards with wrong addresses or where parties were wanting information out of curiosity and were not really "prospects"	10
Number of houses estimated and parties yet undecided	1
Number of "prospects" estimated who could not be secured	6
Number of residences connected up during campaign that gave their contracts to non-co-operating companies (7199 watts)	21
Number of new services connected up since Nov. 21	101
Number of contracts yet to be completed	25

data concerning it. In speaking of the compaign results obtained before the recent convention of the Iowa State Section of the N.E.L.A., Mr. J. S. Forbes, Cedar Rapids, said that the "fixed-price" wiring scheme was without an equal as a means for securing new business from owners of already-built houses.

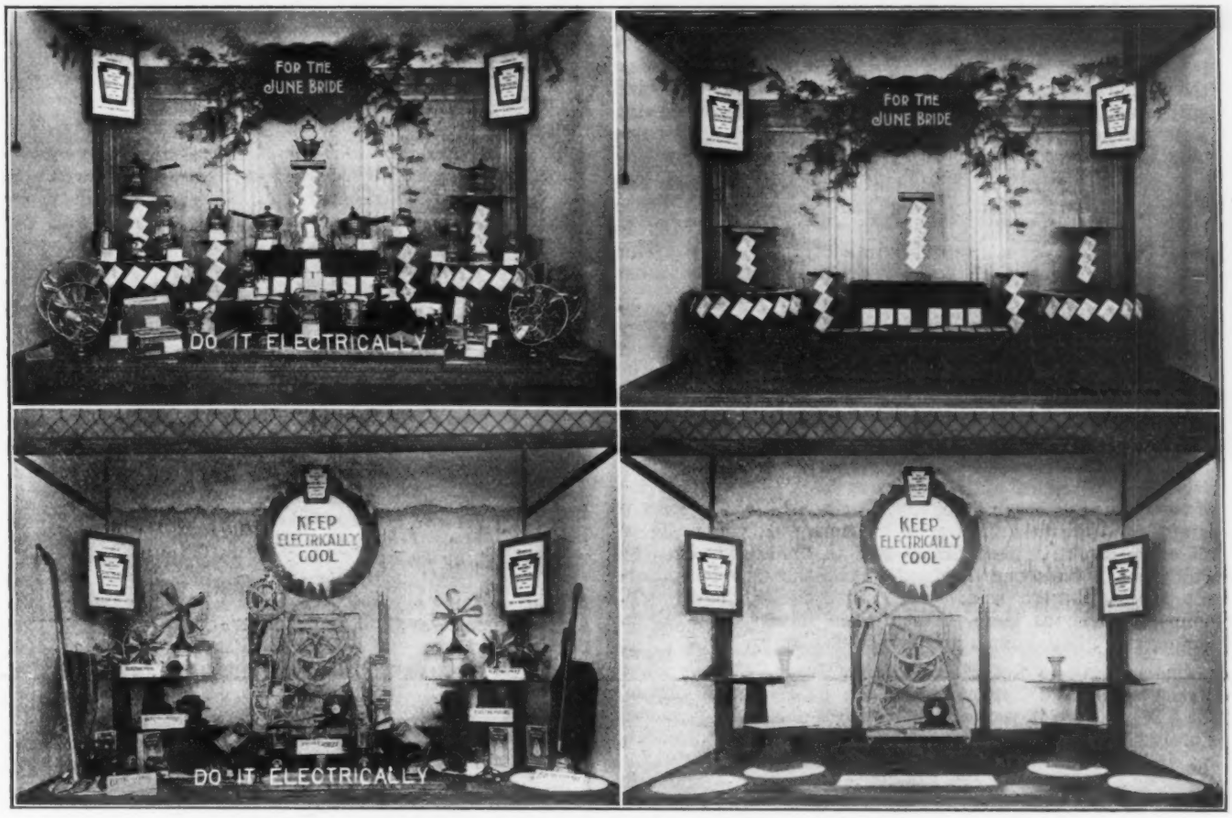
Montreal Contracting Situation

In a recent interview with a representative of the *Electrical World*, Mr. W. B. Shaw, of the Montreal Electric Company, stated that while general business in eastern Canada is quiet, the prospects are that better trade will follow the recent opening of navigation on the St. Lawrence River. Prudent management is called for in the electrical business field at present. The contractors are on good terms with the Montreal Light, Heat & Power Company and other energy-distributing organizations, and there appears to be a disposition in central-station circles to encourage the sale of electrical conveniences at a reasonable profit. Some difficulty has been encountered in electric-range campaigns through the unwillingness of prospective customers to pay the cost of wiring, which usually is about 10 per cent of the cost of the range, but the public is gradually being educated to appreciate electrical conveniences.

Montreal is thus far known principally as a great center of electric power service, nearly all the industrial plants of any magnitude in the city being consumers of hydroelectric energy, but the field is steadily broadening to include a more comprehensive utilization of appliances. The electrical repair business is at present in excellent condition in the city, and those engaged in this line feel optimistic.

Electric Window Settings of Society for Electrical Development

The Society for Electrical Development, Inc., has inaugurated a window-dressing department which is intended to give its members direct service in the way of suggestions for seasonable displays. Mr. A. J. Edgell has been placed in charge of this department. Windows will be trimmed and photographed, two photographs of each window being sent to members, one showing the fixture setting and the other the finished window. The photographs will be accompanied by instructions as to how to trim the window to secure the results shown in the photographs. Four views of windows are shown herewith. As more weddings take place in June than in any other month, wedding gifts must be bought, and the married couple will want to furnish their house in the most comfortable way for the summer. One window display shows how a number of electrical appliances and devices can be featured to an excellent sale advantage at this time.



SHOW WINDOWS ARRANGED BY THE SOCIETY FOR ELECTRICAL DEVELOPMENT

The central decorative figure consists of a double heart and arrow cut from red cardboard and lettered in white. Two membership posters are mounted on contrasting cardboard and placed in either end of the window. There is a pyramid arrangement in the center of the window with five pedestals used throughout to give a graduated height to the display. If fixtures as illustrated cannot be had, home-made stands or boxes may answer. A number of advertising pamphlets or circulars are scattered here and there throughout the trim to add color to the showing. On either side of the window are two circular display fixtures cut from compo board. Two large barrel heads will answer for this purpose. Of course it is necessary to cover all rough woodwork with suitable material. Velours is the best, but inexpensive cloth or crêpe paper will serve.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Electric Vehicles for Transfer Service.—The Baker Motor Vehicle Company has sold many electric trucks for transfer service in New York recently. It is claimed that its 1914 model brougham is also meeting with considerable favor in that city.

Central-Station Company Orders 6000 Irons.—The Union Electric Light & Power Company, St. Louis, Mo., recently ordered 4000 standard 6-lb. General Electric household irons to be disposed of during the summer months. Immediate delivery was asked on the entire shipment.

Planning for Increased Business.—Although business for both the Railway & Industrial Engineering Company and the Transmission Engineering Company is said to be dull at present, the feeling regarding the future is optimistic. Both companies have moved to larger quarters at Greensburg, Pa.

Ventilating Fans for Small Theaters.—The Typhoon Fan Company, 1544 Broadway, New York, has been making a number of installations of its large low-speed fans in theaters having capacities up to about 1500 people. This fan is also being used extensively in schools and other public buildings.

Waverley Trucks for Pittsburgh Lighting Company.—Five Waverley 2-ton electric trucks were shipped recently to the Duquesne Light Company, Pittsburgh, Pa. The slogan "You can do it better with electricity" is printed on the battery boxes of these trucks and effectively and forcibly calls the attention of the public to the advantages of electricity.

Number of Sales of Searchlamps Large.—The business of the Carlisle & Finch Company, Cincinnati, Ohio, in searchlamps for May was very good. Shipments were made to all parts of the United States and to Canada, China, the Philippine Islands and England. Following are the different types of units sold: seven 7-in. lamps, eleven 9-in. lamps, one 12-in. lamp, fifteen 14-in. lamps, nine 19-in. lamps, two 24-in. lamps, and two 30-in. lamps.

Endeavoring to Get More Foreign Trade.—At the First National Foreign Trade Convention held in Washington, May 27 and 28, it was arranged to organize the National Foreign Trade Council, consisting of thirty men representing industrial, commercial, transportation and financial interests. The object of this council is to make a systematic campaign to extend American foreign trade. The members of this trade council are to be appointed by the president of the convention, Alba B. Johnston, who is president of the Baldwin Locomotive Works.

Electric-Vehicle Route Book.—A touring book for users of electrical vehicles in the vicinity of New York City has been issued by the New York Electric Dealers' Association. The book indicates resorts and routes within the touring capacity of the electric vehicle, showing on the map distances, alternate routes and charging stations. The various routes are described in detail. The longest runs are to Poughkeepsie on the north, New Haven to the east, and Trenton and Atlantic City to the south. The book is distributed through manufacturers and agents of electric-vehicle manufacturers.

Mercury-Vapor Lamps for Motion-Picture Studios.—More than fifty motion-picture studios both in the United States and foreign countries are reported to have been recently equipped with Cooper Hewitt tubular lamps. Each of these installations represents from 100 to 1000 lamps. The Cooper Hewitt lamp is also used extensively in factories and workshops. The Cooper Hewitt company is putting out a reflector made of rhodamine, which gives the light a daylight value. A new so-called "targon" filament lamp is being placed on the market by the above company. It is made in sizes rated at 1650 watts, 2750 watts and 5500 watts.

Committee to Inspect Automobile Headlamps.—Many of the large cities in America are considering the danger of high-powered headlamps on automobiles. Chicago has appointed a committee called the Board of Motor-Vehicle Headlight Inspection to pass upon some forms of glare subduers in the construction of the lamps so that a proper driving light can be obtained by using headlamps. After a lamp has been inspected by this board, a certificate of inspection is awarded to the manufacturer. The Ward Leonard Electric Company, Bronxville, N. Y., is one of the concerns which have recently obtained such a certificate from the Chicago board.

Rush Season for Ice Equipment Closing.—Now that the summer months are here and the ice-making plants are generally working at full capacity there are not many orders for new equipment. The United Ice Improvement Company finds conditions thus and expects a lull until about September. Mr. W. Everett Parsons, vice-president of this company, has designed a "quick-freezing" system which is employed in installations made by this company. With this system perfect ice can be made, it is claimed, in twelve hours. This system is used in the refrigerating plant now being installed in the Hudson Terminal Building, 30 Church Street, New York, and it will also be used in the plant to be put in the new Equitable Building, New York.

Belt-Drive Mechanism Proving Popular.—The "Lenix" belt-drive mechanism, which is being made by F. L. Smidth & Company, cement engineers, Copenhagen, Denmark, is being installed in a number of electric plants in the United States, where economy of space is necessary. This drive was originally developed for use in cement plants. Just at this time there is a lull in the cement industry, and F. L. Smidth & Company are pushing the Lenix drive for other applications more than usual on that account. This drive consists of two counter-weighted arms attached to a roller. The roller bears down on the belt in such a way that the arc of contact with the pulley is increased, and it automatically takes up all slack. F. L. Smidth & Company have an office at 50 Church Street, New York.

Big Field for Manufacturers of Ball Bearings in United States.—Mr. C. F. Sultmeyer, formerly manager of the Globe Ball Bearing Company, asserts that well-made bearings are in great demand in the United States and that the larger portion of those used in this country are imported. Mr. Sultmeyer was for a number of years in the ball-bearing business in Germany and he has designed several automatic electric machines for making ball bearings. The entire equipment of the Globe Ball Bearing Company was recently sold to the Willis-Oberlin Company, Toledo, Ohio. This equipment was moved to the latter company's plant at Elmira, N. Y., where the bearings for all its cars will be made. The Globe Ball Bearing Company will be reorganized in the near future, and a new plant will probably be erected in Norwich, Conn.

Automatic Swinging-Disk and Electric-Lamp Signal.—The Bryant Zink Company, 600 Orleans Street, Chicago, Ill., has recently placed on the market a highway signal, consisting of a metallic disk in the center of which are placed two incandescent lamps between two 4-in. red lenses. Only one of these lamps is used at one time, and in case one burns out an automatic relay cuts in the other lamp. The disk is suspended from an arm extending from a post erected at the side of the road toward the center of the highway and when operating gives the effect of a red lantern swinging across the roadway. In conjunction

with this "autoflag" an alarm bell can also be used. The business of this company is rather slack at present. This is due, it is claimed, to suspension of railroad work until the new rate increases are made.

Pushing Sales of Semi-Direct Units.—Mr. Edward O. Coles, general New York sales agent of the Luminous Unit Company, St. Louis, Mo., declares that he is carrying on a vigorous selling campaign and that the number of sales of "brascolite" fixtures, particularly to the retail trade, has been quite large. The brascolite unit is provided with what may be called its own ceiling. Various artistic designs have been made, and the fixture lends itself well to showroom and office illumination. It has been found that in banks, showrooms, offices, etc., where direct lighting of a more or less inferior kind is used those in charge are usually quite willing to consider a new method of illumination, and by installing one or two trial fixtures in these places, whereby the old lighting system can be compared with the new, many sales are often closed. A showroom has been established at 56 West Forty-fifth Street, and though it has been opened only since Feb. 1, Mr. Coles is contemplating renting enlarged quarters.

Ball-Shooting Target.—A. C. Smucker, ventilating engineer, 30 Church Street, New York, has designed a target which is operated by means of an electrically driven blower. The apparatus is simple, consisting of a tapered pipe provided with vertical outlets. This pipe is connected to a blower and is tapered to equalize the pressure throughout. The air passing from the outlets is made to play on small balls. These balls are held in mid-air in a manner similar to that used with decorative balls on fountains. Reducers are provided for the outlets so that the balls can be kept at any height desired. The advantage of using air for such a target instead of water is that there is no stream line for the marksman to follow as is the case with water, air of course being invisible and the balls seeming to dangle in mid-air with no visible means of support. Mr. Smucker has used this scheme for window advertising purposes also. Balls of quite large diameters, when made of the proper material, he has found, can be used, and advertising matter may be printed on the surfaces of these balls.

Interest Aroused in Lanz Locomobiles.—The Wiener Machinery Company, 391 Hudson Terminal, New York, was recently appointed sole representative in the United States and Canada for Heinrich Lanz, Mannheim, Germany. The Lanz locomobile is a combination of boiler, super-heater and engine in one unit, compactly assembled for eliminating radiation and pipe losses and economizing floor space. One of its features is the manner in which the engine is connected; the main parts are not inseparably riveted together, but are independent of each other. The crank-shaft bearings rest on lateral supports riveted to the boiler shell. The so-called Lanz valve gear used with this locomobile consists of a direct-acting distributing mechanism without any intermediate parts; the valve is lifted by means of one roller moving on a cam. A number of installations have been made in foreign countries. One of these consists of three Lanz engines for the electric central station of the harbor pumping plant of Lisbon, Portugal. These units act as prime movers for the direct-coupled sets. The Lanz locomobile is adapted for transport over difficult roads such as are often encountered in sparsely settled countries. A special truck has been designed for this purpose. This vehicle is arranged so that the boiler supports can be bolted to the axles.

Annapolis Public Utilities Company New Equipment.—President George T. Bishop of the Washington, Baltimore & Annapolis Electric Railroad Company, which owns the entire capital stock of the Annapolis Public Utilities Company, in his annual report to stockholders described the improvements in transmission. Under the contract with the Potomac Electric Power Company it was found that energy could be delivered at Annapolis with greater reliability and more satisfactorily than it could be generated at Annapolis. Accordingly the old plant at Annapolis was abandoned and a new transmission line paralleling the old one was authorized, together with a new substation in Annapolis. This substation, a brick and concrete structure, contains two 360-kw and one 120-kw motor-generator set, with the necessary transformers and switchboard apparatus to take care of the commercial city motor and lighting service, and three fifty-light arc rectifier sets to furnish energy for the arc and series incandescent street lamps in the city. The new substation also contains the two 300-kw rotaries used to furnish energy for the railroad. Since the railroad purchased the stock of the Annapolis Public Utilities Company new street-lighting equipment has been installed and the total service largely extended.

Growth of Electric Utilities.—The American Public Utilities Company has issued the following statement: "The commercial showing of the subsidiaries of the American Public Utilities Company in twelve different cities for the week of May 16, 1914, when compared with a similar period of 1913, is remarkably satisfactory. The output of gas and of electric energy shows increases ranging from 5 to 40 per cent. The increase in the amount of gas used is natural and was to be expected, owing to the growth of the communities in which the companies are situated and to the fact that the modern method of cooking is being almost universally adopted. The increase, however, in the amount of electric energy manufactured and marketed is more significant and important, for the reason that at all the plants more or less energy is used for power for manufacturing purposes. Taking into consideration the general conception of rather unsettled business conditions, the increase in the output of electric energy is very encouraging as showing a tendency toward the restoration of industrial activity and is an indication of healthy growth in industrial circles." This information confirms the views expressed in the *Electrical World* regarding central-station expansion in the current year. In last week's issue official data were presented from light and power utilities operating in the Central States, showing that their business for March, 1913, was increasing at a satisfactory rate, not much less than that established by the last census as the five-year average. Several of the electric properties of the American Public Utilities Company operate in the East North Central belt, in which the average rate of expansion seems to be about 13 per cent on a basis of income from the sale of energy, and about 14 per cent on a basis of kilowatt-hour output. While the rate of growth of the electric utilities throughout the country is not so great as it was a year ago, in view of the widespread business depression the proved rate of expansion is gratifying and even remarkable. There are many signs of confirmation of this condition, such as the evidence from the American Public Utilities Company.

Growth of the Central-Station Business on the Pacific Coast.—The central-station companies in the States of California, Oregon and Washington are not obtaining this year such increases as were experienced a couple of years ago and as are still being maintained by the electrical utilities in certain other sections of the country. The *Electrical World* has already presented some estimates of central-station growth in the Atlantic, New England and Central States, based upon authentic returns of kilowatt-hours output and revenue from the sale of energy, and while similar official data from the Coast companies are not very numerous, authentic figures for gross earnings of the properties are nevertheless available. The companies in San Francisco, Los Angeles and Seattle have not obtained a great increase in gross over 1913. It can be seen from the published statements of the Pacific Gas & Electric Company, the Southern California Edison Company and the Puget Sound Traction, Light & Power Company that gross earnings increased by only $62,315 from March, 1913, to March, 1914—$2,480,837, against $2,418,522, or 2.6 per cent. The unusually wet California season has had a radical effect on the character of this year's irrigation load of the companies in that State, particularly on the Southern California Edison Company. Little pumping has been necessary this spring, and the revenue from this source has fallen off very considerably. At the same time, and partly as an offset to this, it should be noted that one of the principal reasons for the ability of the Pacific Gas & Electric Company to decrease its operating expenses as it has done this year resides in the fact that the winter rains filled up the pondage to an unexampled extent and left the hydraulic plants in excellent shape for carrying the full load without the help of the steam auxiliaries. This circumstance will prob-

ably continue to have a beneficial influence for some time to come. So far as Seattle is concerned, gross earnings of the Puget Sound Traction, Light & Power Company are sure to be affected favorably by the recent action of the Railroad Commission in abrogating a decision of 1910 and virtually instructing the utility to file a new schedule of increased fares, with the admission that the theories upon which the reduction of 1910 was based are no longer operative. Official returns received from other Coast cities of 100,000 population show an increase in revenue from energy sales of some 6 per cent on a total of $500,000, corresponding to an increase in station output of 5.5 per cent. It is worth while noting again that, whereas in the Eastern States a kilowatt-hour of energy sold (considering all lighting, motor service and railway loads) represents a gross yield of some 3 cents, in many of the Pacific areas the gross return is little more than 1 cent; or, in other words, a company turning out say 250,000 kw-hr. in the month will receive only some $300,000 from the energy sold. These approximate indications of the 1914 rate of central-station expansion in the Western States may be converted into figures and tabulated with the results already given for the Eastern and Central States. Returns from the Mountain States, though not representative, seem to indicate a healthier rate of increase than in the cities of the Coast. For the present purpose it may be sufficiently accurate if a value of 5 per cent is selected as the 1914 expansion coefficient for gross earnings and 6 per cent for energy output for the states which are embraced in the combined mountain and Pacific Coast areas.

ESTIMATED EARNINGS AND OUTPUT FOR MARCH, 1914, FOR CONTINENTAL UNITED STATES BY GROUPS OF STATES*

	Gross Earnings from the Sale of Energy, in Dollars			Total Energy Output in Kilowatt-hours		
	March, 1914	March, 1913	Per Cent Increase	March, 1914	March, 1913	Per Cent Increase
Middle Atlantic	10,300,000	9,717,000	6.1	314,500,000	292,500,000	7.5
South Atlantic	1,798,000	1,615,000	11.3	104,500,000	85,170,000	22.8
Central	12,374,000	11,133,000	11.2	441,700,000	391,585,000	12.8
New England	2,910,000	2,720,000	7.1	92,600,000	86,000,000	7.7
Mountain & Pacific	4,531,000	4,315,000	5.0	303,950,000	286,745,000	6.0
Total for United States	31,913,000	29,500,000	8.2	1,257,250,000	1,142,000,000	10.0

*Rates of expansion based upon official figures collected by the *Electrical World* from approximately one-half the entire industry.

NEW YORK METAL MARKET PRICES

	June 2 Bid	June 2 Asked	June 9 Bid	June 9 Asked
Copper				
Standard spot*	13.50	14.00	13.40	13.00
	Selling Prices		Selling Prices	
	£ s d		£ s d	
London, standard spot*	62 6 3		61 17 6	
Prime Lake	14.12½	to 14.37½	14.12½	to 14.37½
Electrolytic	13.95	to 14.05	13.85	to 13.95
Casting	13.80	to 13.90	13.70	to 13.80
Copper wire base	15.25	to	15.25	to .....
Lead	3.90		3.90	
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter	7.00		7.00	
Spelter, spot	5.10	to 5.20	5.10	to 5.20
Tin, spot	30.25	to 30.65	30.50	to 30.75
Aluminum:				
Prompt delivery	17.75	to 18.00	17.75	to 18.00
Future	17.75	to 18.00	17.75	to 18.00

*OLD METALS

Heavy copper and wire	12.62½	12.87½
Brass, heavy	8.50	8.62½
Brass, light	7.37½	7.50
Lead, heavy	3.90	3.90
Zinc, scrap	4.00	4.15

*COPPER EXPORTS

Total tons to June 9	11,808

*From daily transactions on the New York Metal Exchange.

Corporate and Financial

Easton Consolidated Electric Company Notes.—In his annual report President H. R. Fehr sums up the financial report for the year ended Dec. 31, 1913. The gross revenue from railway lines increased $40,972, or 9.58 per cent, while the operating expenses were 62.06 per cent of the revenue. The net earnings totaled $149,450, of which $126,437 came from the railways and $23,013 from the Edison Illuminating Company. A deduction for fixed charges of $71,076 left as surplus earnings $78,374, out of which was paid $30,000 in dividends. This left a surplus of $48,374, making the total surplus $190,338.

Blackstone Valley Gas & Electric Company Operating Arrangement.—The Blackstone Valley Gas & Electric Company has made an operating arrangement with the Rhode Island Power Transmission Company, a subsidiary of the New England Power Company. The Blackstone company will use electrical energy generated by the hydroelectric plants of the New England Power Company and the Connecticut River Power Company. The arrangement contemplates interchange of service so that the steam plants of the Blackstone company will help out the hydroelectric plants in dry seasons. The Rhode Island Power Transmission Company will furnish additional energy if needed.

Lehigh Valley Transit Company Operations.—The Lehigh Valley Transit Company, besides acquiring the controlling interest in the Easton Consolidated Electric Company, has organized new lighting companies and secured charters covering the borough of North Catasauqua and Allen Township in the county of Northampton, Pa.; the borough of Coplay and Upper Gancon township in the county of Lehigh, the townships of Doylestown, Hilltown, Richland, Springfield, East Rock Hill and New Britain in Bucks County, and Hatfield in Montgomery County. All franchises with one exception are without time limit. The lighting and motor-service business has increased substantially and very satisfactory results have been obtained.

Columbus Railway, Power & Light Company Plans.—The Columbus (Ohio) Railway, Power & Light Company has called a special meeting of stockholders for June 29 to authorize the issue of $3,145,000 of 4 per cent prior preference stock. This stock is to be issued for the purpose of retiring in whole or part $3,145,000 outstanding first consolidated mortgage 4 per cent bonds of the Columbus Railway Company. Stockholders will also be asked to approve an issue of $450,000 Series A 6 per cent preferred stock to retire the $450,000 6 per cent first mortgage bonds of the Columbus Electric Company. The stockholders will be asked to approve an authorized issue of $25,000,000 first and refunding sinking fund 5 per cent bonds.

Public Service Company of Northern Illinois.—The annual report of the Public Service Company of Northern Illinois for the year ended Dec. 31, 1914, shows gross earnings of $6,066,825, expenses including taxes of $3,590,100, and net earnings of $2,476,725. Against this was charged interest amounting to $1,307,399. There was deducted for depreciation reserve $121,120, leaving $1,048,206 available for dividends. The sum of $840,513 was paid in dividends. This left $207,693 to be carried to surplus. During the year obligations of subsidiary companies amounting to $110,900 were either retired or deposited with the trustee under the company's first and refunding mortgage. This brings the total of retired or deposited obligations up to $6,839,900. The company's outstanding bonds and notes have increased during the year $4,118,000. The increase in funded debt is due to the consolidation with the Northwestern Gas Light & Coke Company, to the acquisition of the plant of the Pontiac Light & Water Company, to the addition of a 7500-kw turbo-generator in the Blue Island electric station, to the addition of a 5000-kw turbo-generator in the Waukegan electric station, to the installation of a gas holder at Kankakee and to extensions of transmission lines. During the year the rate of dividends on the common stock was increased from 4 per cent to 5 per cent. The company's connected business in supplying electrical energy (exclusive of railway power business) amounted to the equivalent of 1,837,630 standard 16-cp lamps on Dec. 31, 1913, being an increase of 369,024 standard 16-cp lamps during the year.

Brazilian Traction, Light & Power Company, Ltd.—The board of directors of the Brazilian Traction Light & Power Company, Ltd., has issued its first complete report, covering the period from the incorporation in July, 1912, to Dec. 31, 1913. The company is a consolidation of the Rio de Janeiro Tramway, Light & Power Company, Ltd., the Sao Paulo Tramway, Light & Power Company, Ltd., and the Sao Paulo Electric Company, Ltd. For the eighteen months the gross revenue was $11,522,837. Deductions for interest and expenses made the surplus available for dividends $11,198,493. Dividends amounted to $8,185,495, leaving a surplus carried to profit and loss of $3,012,998. The Rio de Janeiro division showed a gross income of $4,520,507 for lighting and motor service. The Sao Paulo division showed $1,858,380 gross income from the same sources. The Sao Paulo Electric division showed a gross income of $1,731,219. This made a total for lighting and motor service of $8,110,106, or 34 per cent of the total gross income of the subsidiary companies.

Crocker-Wheeler Company Statement.—The statement of the Crocker-Wheeler Company as of Dec. 31, 1913, issued to stockholders by Dr. Schuyler Skaats Wheeler, the president, shows a net profit from operation for the year 1913 of $300,089. From this there was deducted as a reserve for replacement of plant $94,917, leaving a balance of $205,172. Common and preferred dividends amounting to $102,750 were paid. There was also deducted as a reserve for accrued preferred dividends $8,750. Interest amounted to $50,035. The total of these three items is $161,535. The balance was $43,637. There was added as profit on the sale of land $31,695, making a total surplus for the year of $75,332. The balance-sheet surplus at the close of the year was $461,061. Plant, including land, building, tools, patterns, equipment, etc., less the account reserve for depreciation, deducted, $783,313, amounted to $1,447,739. Patents at cost, less depreciation, deducted, $104,832, stood at $25,000. The value of merchandise on hand, at shop cost, was $1,041,258.

Annual Report of the Western Railways & Light Company.—For the year ended Dec. 31, 1913, the gross earnings from operation were $2,541,684. Deducting operating expenses and taxes of $1,585,536 gives net earnings from operation of $956,148. Other revenue amounted to $31,316, making the total net earnings $987,464. With interest at $620,561, the amount available for dividends $366,903 and dividends on preferred stock $190,140, the net surplus becomes $176,763, a slight increase over last year. During the year the company expended for the upkeep of properties $364,081, which is 14.32 per cent of the gross receipts. The following items make up the gross earnings: interurban lines, $548,745; city lines, $942,432; gas, $350,462; electric, $659,364; steam, $27,142; water, $13,539—a total of $2,541,684. The company expended for improvements $577,631 in developing its interurban lines and city motor-service and lighting equipment. During the year the company acquired the following companies: Jefferson City Bridge & Transit Company, Knoxville Electric Light & Power Company and People's Traction Company. The increased consumption of energy for lighting and industrial use was gratifying.

Minneapolis General Electric Company Notes.—An issue of $2,000,000 of three-year 6 per cent notes of the Minneapolis General Electric Company has been placed on the market by William P. Bonbright & Company, New York, and H. M. Byllesby & Company, at 99 and interest. The notes are part of an authorized issue of $3,000,000. The remaining $1,000,000 notes will not be issued until after Dec. 1, 1915. For the year ended April 30, 1914, the gross earnings were $1,952,790, compared with $1,785,309 in 1913 and $1,599,770 in 1912. The net earnings for the same periods were, respectively, $1,157,296, $1,027,125, and $915,652. The surplus for the year ending April 30, 1914, was $645,057. That the company is developing is indicated by the following connected-load statistics: Electric light customers in 1914, 24,422, or an increase of 24.6 per cent; electric power customers in 1914, 2245, or an increase of 16 per cent, making an increase in total customers of 23.8 per cent. Incandescent lamps increased from 581,903 in 1913 to 662,122 in 1914, or 13.7 per cent, and municipal arc lamps from 2335 to 2759, or 18.1 per cent. The total kilowatt lighting load increased 26.7 per cent, and 21.6 per cent more hp in stationary motors was served.

Annual Report of the York Railways Company.—In the annual report of the York Railways Company, President Gordon Campbell stated that in spite of general business depression the business showed wholesome gains for the year. Earnings from the light and power company were augmented by the addition of the business of a section of the country southeast of York, having its center about 8 miles from Center Square and including the borough of Red Lion, Dallastown, Yoe and Windsor. This territory was formerly served by the York & Windsor Electric Light Company, a local company which obtained its energy from the Edison Electric Light Company at wholesale rates. The company purchased the York & Windsor Electric Light Company and formed the Edison Light & Power Company by merger of the Edison Electric Light Company, the York & Windsor Electric Light Company, with franchises in Yoe, Dallastown and Red Lion, and fourteen suburban lighting companies. Because of this new acquisition a substation was built in Red Lion in combination with a freight station for the railway. The transmission line was reconstructed. The old electric-light poles in Dallastown and Red Lion were replaced by 50-ft. poles and in many cases combined with the railway poles.

Los Angeles Gas & Electric Corporation Statement.—During the year ended Dec. 31, 1913, the gross earnings were $4,527,164 as compared with $4,178,176 for 1912. Operating expenses and taxes were $2,589,594 as compared with $2,335,212. The net earnings were $1,937,570 in 1913 and $1,842,964 in 1912. Interest was $400,943 as compared with $396,405. The surplus for 1913 was $1,536,627, while that for 1912 was $1,446,559. Since May 1, 1904, $4,468,352 has been allowed for depreciation. The corporation is required to make annual sinking-fund payments, which began on July 1, 1910, equal to 2 per cent of the total amount of bonds outstanding. Up to the present time $747,500 underlying and corporation refunding mortgage 5 per cent bonds have been canceled or are held alive in sinking funds. The annual report issued to stockholders says that the physical property of the corporation alone is valued at over $20,275,000 without any allowance for franchise or good-will, or over two and one-half times the $7,902,500 of outstanding bonds. Although the gas business is the principal business of the company, the electric plant has a rated capacity of 25,650 hp. There are 2353 miles of electric overhead main wire and 21 miles of underground conduits; 36,086 electric meters are in use. The total electric connected load is 63,450 hp.

Atlantic Gas & Electric Company Operations.—By far the larger amount of the investment now under way by the subsidiary and affiliated companies of the Atlantic Gas & Electric Company, according to a statement issued by Arthur D. Lord, president of the company, is being used for improvements to the properties in the Easton (Pa.) district. This work is now nearing completion. The station building has been enlarged and the generating apparatus rearranged. In January a new 6333-hp turbo-generator was put into commission, while it was expected that a second one of the same size would be ready for operation about June 1. Other new apparatus includes a new switchboard, two new 1165-hp Stirling boilers, outdoor high-tension switches and transformers, and steel terminals for the high-tension transmission lines running out of Easton. One year ago the rating of the plant was 2000 hp; now, including the latest addition, it is 16,333 hp. The new station building at Boonton, N. J., has been completed and in addition to its present capacity of 500 hp two 1000-hp turbo-generators have been installed. Additional boilers are being added and plans are being made for the development of the hydroelectric equipment of the company to its full capacity. The Sayre Electric Company, which the company acquired in 1907, has authorized the purchase of an additional 1300-hp turbo-generator with necessary auxiliaries. Since 1907 the income of this plant has increased over 60 per cent, while the output so far this year is 15 per cent over that of last year. The company has closed a contract with the Morris County Traction Company for the operation of its lines in the Boonton-Dover-Wharton district for a term of ten years, covering 25 miles of electric road. A transmission line 15 miles in length is being built to furnish this service. In the Easton district extensive betterments are being made.

Business Notes

The Bruce-Macbeth Engine Company, of Cleveland, Ohio, has renewed its lease in the Oliver Building, Pittsburgh, Pa., for its branch office.

The General Insulate Company, Brooklyn, N. Y.—Fred. Steinberger has been appointed sales manager for this company in the Middle West, with headquarters at 9 South Clinton Street, Chicago, Ill.

Moloney Electric Company, St. Louis, Mo.—Arthur Purdon has been made assistant in the sales department of this company. Mr. Purdon was formerly connected with the Westinghouse Electric & Manufacturing Company.

The Electric Service Supplies Company has recently added the services of W. J. Bryan to its sales force. Mr. Bryan graduated in engineering at the University of Michigan in the year 1906, and was for five years connected with Wm. B. Scaife & Sons Company, Pittsburgh, Pa. He will represent the Electric Service Supplies Company in the New England States, with offices in Boston.

United States Light & Heating Company.—L. R. Pomeroy, consulting railway and electrical engineer, has been appointed manager of the New York sales office of the United States Light & Heating Company, the general offices of which are now at Niagara Falls, N. Y. Mr. Pomeroy has under his direction the sales of the U-S-L axle electric car-lighting equipment, U-S-L electric starter and light and U-S-L storage batteries.

Julius Andrae & Sons Company.—L. W. Orear has been placed in charge of the engineering department of the Juilus Andrae & Sons Company, Milwaukee, manufacturer and dealer in electrical supplies. Mr. Orear, who graduated from the electrical engineering department of the Missouri State University in 1900, was for many years connected with the United States Steel Corporation and later with the Jones & Langhlin Steel Works and the Lehigh Portland Cement Works, at New Castle, Pa.

New Industrial Companies

The Ward Electric Company, of Asheville, N. C., has been incorporated with a capital stock of $10,000 to carry on a general electrical engineering business. The incorporators are W. A. Ward, M. C. Ward and others.

The Majestic Appliance Company, of New York, N. Y., has been incorporated with a capital stock of $10,000 by J. P. Ryan, 158 East Thirty-sixth Street, New York; W. Burrows, of New York, and A. Rosenburg, of Jamaica, N. Y.

The American Electric Sign Company, of New York, N. Y., has been granted a charter with a capital stock of $5,000. The incorporators are H. Goldschmidt, J. Lieberman and P. Adelstein, 3151 Third Avenue, New York, N. Y.

The Acton Electric Company, of New York, N. Y., has been incorporated with a capital stock of $27,000 to manufacture and deal in electrical appliances, etc. The incorporators are G. K. Hamblin, Metuchen, N. J., O. A. Hirsch and E. B. Walsh, of New York, N. Y.

The Perkiomen Electric Transit Company has filed articles of incorporation under the laws of the State of Delaware, with a capital stock of $25,000, to manufacture electrical apparatus and machinery. The incorporators are J. L. Wolcott, M. L. Cole and J. H. Hughes, of Dover, Del.

The Marathon Electric Manufacturing Company, of Wausau, Wis., has been incorporated by Neal Brown, D. C. Everest and E. M. Bischoff. The company is capitalized at $25,000 and proposes to manufacture small electric motors, from 1/60 hp to 2 hp. The company will manufacture both alternating-current and direct-current motors of special design.

The Wells Construction Company, of New Richmond, Wis., has been organized with a capital stock of $10,000 for the purpose of manufacturing and installing individual electric-lighting plants and to deal in electrical equipment. The officers of the company are: P. F. Neverman, president; P. C. Harmon, vice-president, and A. S. Wells, secretary and manager.

Trade Publications

Pyrometers.—Catalog No. 9 of the Brown Instrument Company, Philadelphia, Pa., illustrates and describes the comprehensive line of indicating and recording pyrometers made by this company.

Substations.—The Delta-Star Electric Company, 617 West Jackson Boulevard, Chicago, Ill., has recently issued an illustrated thirty-six-page bulletin describing its new-type steel-tower outdoor high-tension substations.

Auto Starters.—Leaflet 3512-A issued by the Westinghouse Electric & Manufacturing Company refers to the auto-transformer starter for squirrel-cage motors. Its construction is fully described and illustrated, as is also the overload relay with which it is equipped.

Bell-Ringing Transformers.—Folder 4172 of the Westinghouse Electric & Manufacturing Company describes its bell-ringing transformer and shows how it should be installed. On the back page is given a comparison between the old method of using batteries and the new way.

Lighting Standards.—In an artistic catalog recently issued by the J. L. Mott Iron Works, Fifth Avenue and Seventeenth Street, New York, are shown some representative examples of posts for electric and gas lighting. Electroliers, lanterns and brackets are shown in many beautiful designs.

Generating Sets.—Alternating-current directly connected generating sets are illustrated and described in Bulletin No. 25, issued by Engberg's Electric & Mechanical Works, St. Joseph, Mich. These sets are made in ratings up to 70 kva for several different speeds. Bulletin No. 24 refers to direct-connected sets.

Anchors.—The "Never Creep" anchor, manufactured by the Chance Manufacturing Company, Centralia, Mo., is illustrated and described in Bulletin No. 3, recently issued by the company. It is claimed for this device that it will hold as great a strain per square inch of surface as any known method of anchoring.

Washing Machines.—The Victor Manufacturing Company, Leavenworth, Kan., in a sixteen-page illustrated booklet with the title "Clean Clothes," gives suggestions for eliminating washday troubles by the use of the "Wonder" washer. Various types are illustrated, among them a motor-driven washing machine, of which a complete description is given.

Water Sterilizers.—In Catalog 14-H of the Forbes Company, 1234 Callowhill Street, Philadelphia, Pa., are described the Forbes water sterilizers, operated by electricity, steam and gas. The principle of operation is discussed and diagrammatically shown. Illustrations are given of some of the prominent buildings of the country in which the Forbes system has been installed.

Transformers.—In Bulletin No. 1280, issued by the Pittsburgh Transformer Company, Pittsburgh, Pa., emphasis is laid on the latest improvement in its transformers, that of the new pressed-steel case. This is said to be a radical improvement over the heavy cast-iron cases heretofore used. The advantages of the lesser weight are fully set forth in this bulletin.

Railway Appliances.—An unusually comprehensive catalog is that of the Ohio Brass Company, Mansfield, Ohio, designated as No. 14-1914. Within its 608 pages are listed a remarkably complete line of appliances used in the construction, maintenance and operation of electric railways, mine haulage systems and transmission lines. The arrangement of the book is excellent, the illustrations are good, and the descriptive matter is well prepared. A number of useful tables and a good index add value to the book.

Headlamps.—The "Golden Glow" headlamps made by the Esterline Company, Indianapolis, Ind., are the subject of an attractive catalog—No. 310—recently issued. The text is printed in black, and the illustrations are appropriately printed in black and yellow, showing realistically the lighting effect obtained by the use of these headlamps. The questions of parabolic reflectors, glass parabolas and incandescent bulbs are fully discussed, and different types of headlamps made by the company are illustrated and described.

Personal Mention

Mr. B. A. Behrend, consulting engineer of Boston, sailed this week on the *Aquitania* for a vacation trip on the Continent.

Mr. J. P. H. de Windt has been appointed general manager of the Birmingham (Ala.) Railway, Light & Power Company.

Mr. F. W. Stearns, vice-president and legal representative of H. M. Byllesby & Company, Chicago, has resigned and is contemplating a trip abroad.

Mr. W. H. Clarke, formerly assistant manager of the bond department of H. M. Byllesby & Company, Chicago, has been appointed manager of that department.

Mr. K. Norton has been appointed superintendent of the municipal electric light and water-works plant at Coldwater, Mich., as successor to Mr. W. H. Friedrich.

Mr. R. E. Wilsey, vice-president and manager of the bond department for H. M. Byllesby & Company, Chicago, has resigned his position and announced his intention of making a trip abroad accompanied by Mrs. Wilsey.

Mr. Lewis Buckley Stillwell, consulting engineer of New York and past-president of the American Institute of Electrical Engineers, was the recipient of the degree of doctor of science from his alma mater, Lehigh University, on June 9.

Mr. Cyprien Odilon Mailloux, president of the American Institute of Electrical Engineers, pioneer professional electrial engineer in America, and the first editor of the *Electrical World*, was honored with the degree of doctor of science by Lehigh University on June 9.

Mr. Edward M. Graham, who has been assistant to President John H. Graham of the Bangor (Me.) Railway & Electric Company, has tendered his resignation, effective July 1. Mr. Graham has purchased an interest in the Frank Ridlon Company, of Boston, contractors and dealers in electrical supplies.

Mr. A. H. Ford, whose resignation as president of the Birmingham (Ala.) Railway, Light & Power Company to accept the post of general manager of the Cumberland County Power & Light Company of Portland, Me., was announced in these columns on May 30, was presented with a silver service by the employees of the company on May 28.

Mr. Frank H. Gale, well-known advertising manager of the General Electric Company, suffered a bereavement by the death of his wife on May 31. Telegrams of condolence were forwarded to Mr. Gale by the Commercial Section of the National Electric Light Association at the Philadelphia convention, and by the transportation and exhibition committees, of all of which he is an active member, and also by a host of friends.

Dr. Harold Pender, professor of electrical engineering and director of the research division of the department of electrical engineering at the Massachusetts Institute of Technology, will become professor in charge of the department of electrical engineering at the University of Pennsylvania in the fall. This department was formerly under the joint direction of the Whitney professor of dynamical engineering, but from January next the electrical engineering department will be on an independent footing. A biographical sketch of Dr. Pender appeared in the *Electrical World* of Aug. 8, 1913.

Mr. W. A. Thomas, who for several years past has been commercial engineer in charge of all sales of mining apparatus for the Westinghouse Electric & Manufacturing Company, with headquarters at East Pittsburgh, Pa., has resigned his position with this company and has taken up the practice of consulting engineering in mining work at Pittsburgh. Mr. Thomas is a graduate of Pennsylvania State College, and after completing the testing course of the General Electric Company he was for two years in charge of the power equipment of the Pennsylvania Coal & Coke Company at Cresson, Pa.

Mr. Charles L. Eshleman, who was recently appointed vice-president of the Union Metal Manufacturing Company, was graduated from the electrical engineering course at the Pennsylvania State College in 1905 and spent two years in the students' apprenticeship course at the Pittsfield works of the General Electric Company. He has held positions as assistant manager of the lamp and transformer sales department of the General Electric Company, secretary and treasurer of the Jandus Electric Company and sales manager of the Adams-Bagnall Electric Company. He has served as statesman of the Jovian Order and as member of the executive committee and chairman of the publicity committee of the Cleveland Electrical Exposition.

Mr. E. L. Callahan, chairman-elect of the Commercial Section of the National Electric Light Association, is in charge of the various new-business departments of the electric-light, gas and railway properties controlled by H. M. Byllesby & Company. He is thirty-nine years old and was graduated from the Case School of Applied Science in 1900. For three and a half years he was in charge of the sale of electric heating apparatus for the General Electric Company with headquarters in Chicago. Prior to that time he was assistant manager of the Simplex Electric Heating Company, manager of the Prometheus Electric Company, and with Westinghouse, Church, Kerr & Company. The experience he gained in assisting central-station companies in building up electric heating loads and his later experience with the Byllesby syndicate fit him admirably for the post of chairman of the Commercial Section.

E. L. CALLAHAN

Mr. Alfred C. Einstein, first vice-president and general manager of the Union Electric Light & Power Company, St. Louis, Mo., was recently elected president of the Missouri Public Utilities Association. He has had wide experience in construction, operation and management of public utilities. Mr. Einstein was born at Hoboken, N. J., and was educated in the St. Louis schools. After spending several years at Washington University he gave up his studies to accept the general managership of a mining property in Silver City, Mexico. In 1890 he was elected president of the Consolidated Engineering Company, St. Louis, and later held the same office with the Paducah (Ky.) Electric Light & Street Railway Company. The St. Louis County Gas Company was organized by him. Mr. Einstein is also president of the Electric Company of Missouri, which controls the American Light & Power Company, the Tibbe Electric Company, the Pacific Electric Company and the Mississippi River Power Distributing Company.

A. C. EINSTEIN

Obituary

Jacob Furth, president of the Puget Sound Traction, Light & Power Company of Seattle and one of the best known men in financial circles in the Northwest, died June 2. Mr. Furth was born in Bohemia, Nov. 13, 1840, and came to the United States when he was seventeen years old, going directly to California. In 1882 he went to Seattle, and the following year established the Puget Sound National Bank, of which he remained the head until 1910, when it was consolidated with the Seattle National Bank, forming one of the largest banking institutions in the Pacific Northwest. Mr. Furth was made chairman of the board of directors of the consolidated bank and held that position until the time of his death.

Construction

New England

LANCASTER, N. H.—The Lancaster & Jefferson El. Co. may install a new boiler this summer. Walter U. Colby is superintendent.

WEST STEWARTSTOWN, N. H.—Within the next six months the William F. Allen Co., of West Stewartstown, expects to purchase two waterwheels and about 1900 ft. of steel penstock, 6 ft. in diameter. W. F. Allen is manager.

BOSTON, MASS.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 25 for mechanical equipment (except elevators), for the United States immigration station at Boston, Mass. Drawings and specifications may be obtained from the above office or from the custodian of site at Boston. O. Wenderoth is supervising architect.

NORTON, MASS.—The property of the Norton El. Lt. & Pwr. Co. has been purchased by parties said to be interested in the Norton & Taunton St. Ry. Co., of Norton. The new company, it is understood, will erect a power plant near Meadowbrook.

PITTSFIELD, MASS.—The city committee on fuel and street lighting has asked the Pittsfield El. Co. to submit to the city solicitor a contract drawn up for a term of five years embracing the use of luminous direct-current arc lamps made by the General Electric Co. The plans provide for 54 arc lamps erected on pressed-steel posts with hexagonal bases maintained by underground wires. The cost of installing the new lighting system is estimated at $12,000, which will be borne by the company.

PAWTUCKET, R. I.—The Blackstone Valley Gas & El. Co., controlled by the Stone & Webster Corpn., of Boston, Mass., has made arrangements with the Rhode Island Pwr. Transmission Co., a subsidiary of the New England Pwr. Co., by which the Blackstone Valley company will distribute throughout the territory it now serves electrical energy generated by the hydroelectric power plants of the New England Pwr. Co. on the Deerfield River and the Connecticut River Pwr. Co. on the Connecticut River. The steam-power plants of the Blackstone Valley company will be held in reserve for emergency purposes and to use during low-water periods.

NEW HAVEN, CONN.—A permit has been granted the United Illg. Co., of New Haven, to erect a new power house 200 ft. by 144 ft., to cost $90,000, to be located at Grande Avenue and Haven Street.

Middle Atlantic

BATH, N. Y.—The Village Trustees have engaged Mr. Larue, electrical engineer, of Cohocton, to prepare plans and specifications for the municipal electric-light plant, for which bonds to the amount of $50,000 have been voted.

BINGHAMTON, N. Y.—At an election held recently the proposal to issue $148,000 in bonds for the installation of a municipal electric-light plant in Binghamton was carried.

BROOKLYN, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, corner of Park Avenue and Fifty-ninth Street, New York, N. Y., until June 15 for installing electric equipment in new Public School 170, on Sixth Avenue, between Seventy-first and Seventy-second Streets, borough of Brooklyn.

BUFFALO, N. Y.—Plans are being considered for placing the wires on Connecticut Street in underground conduits.

CLAYVILLE, N. Y.—The Town Board has signed a contract with the Utica Gas & El. Co., of Utica, to light the streets of the village. The company will also furnish commercial and residential lighting.

FRANKLINVILLE, N. Y.—Preparations are being made by the Cattaraugus County Ltg. Co., of Franklinville, for extensions and improvements to its system, material for which has been purchased. The equipment will include one 600-kw General Electric motor-generator set (three-phase, 25 to 62½ cycles, 250 volts), switchboard, five General Electric 250-kva, 2200/22,000-volt transformers, two outdoor-type substations, 1000 35-ft. poles. Joseph B. Mayer is president of the company.

LIVINGSTON MANOR, N. Y.—Within the next three months the Livingston Manor El. Co. expects to purchase a generator, exciter and transformers. W. R. Woolsey is secretary and general manager.

MECHANICSVILLE, N. Y.—Within the next three months the Mechanicsville El. Lt. & Gas Co. expects to purchase a switchboard totalizing watt-hour meter. Edwin Farrow is president and treasurer.

MIDDLEVILLE, N. Y.—The Middleville Electric Lt. Co. expects to purchase within the next three months one 50-hp boiler and engine (not yet decided whether kerosene, gasoline or steam will be used).

MOHAWK, N. Y.—The Electric Light Commissioners are expected to purchase material for ordinary extensions to distribution system; also electrical appliances and supplies to meet regular demands. F. D. DuBois is superintendent of the municipal electric plant.

TOMPKINSVILLE, N. Y.—Bids will be received at the office of the lighthouse inspector, Tompkinsville, N. Y., until June 17 for furnishing the lighthouse depot, Tompkinsville, with two oil engines and air compressors. Blank proposals and particulars may be obtained at the above office.

UNADILLA FORKS, N. Y.—The contract for installing an electric-light plant in Unadilla Forks is reported to have been awarded to Lynn H. Baldwin, of Utica. The plant will be owned and operated by Charles A. Backus.

UTICA, N. Y.—The Utica Gas & El. Co., of Utica, has awarded the contract for the construction of a new substation in Rome to Griffiths & Pierce. The building will be 30 ft. by 50 ft. and will have an output of 4000 hp. The company is also erecting a substation in Holland Patent which will supply the villages of Holland Patent and Stittville with electricity.

BELLEFONTE, PA.—The power plant of the State Center El. Co., it is reported, will be removed from Bellefonte to Milesburg. At the new location the plant will be operated by water power instead of steam power.

BEN AVON, PA.—Bids will be received by the Board of school directors of Ben Avon until June 18 for the general contract for electrical work. Plans and specifications and necessary information may be obtained at the office of R. M. Trimble, architect, 705 Ferguson Building, Pittsburgh, Pa. Post office address, Ben Avon, R. F. D., Allegheny, Pittsburgh.

EMPORIUM, PA.—Improvements, it is reported, are contemplated to the municipal electric-light plant, including the installation of a 150-hp gas engine to be operated with natural gas, directly connected to a two-phase, 2200-volt generator, switchboard with necessary station equipment, also extension to distribution lines, including transformer, meters, etc. It is understood that material has not yet been purchased. For further information address Charles Crandall, secretary of borough council.

HAMBURG, PA.—Bids will be received by Dr. Samuel G. Dixon, Commissioner of Health, State Department of Health, Commonwealth of Pennsylvania, Philadelphia, until June 20 for construction of power plant and equipment for the State Sanatorium for Tuberculosis, near Hamburg, Berks County, Pa. Plans and specifications may be obtained at the office of the State Department of Health, in Harrisburg or Philadelphia, upon deposit of $25, to be refunded upon return of same.

HARRISBURG, PA.—Notice has been given that application will be filed by J. C. Dickey, W. O. Grueneisen and R. E. Vokacl with the Governor of Pennsylvania on June 17 for a charter to incorporate the West Deer Township El. Co., at West Deer, Allegheny County. The company proposes to generate and distribute electricity for lamps, heaters and motors in West Deer.

KITTANNING, PA.—The plans and specifications prepared by Arthur M. Morgan, of Chicago, Ill., engineer, for the proposed municipal electric-light plant and water-works system have been approved by the Council.

LANSDALE, PA.—Bids will be received by R. S. Landis, chairman of the Electric Light Department of the borough of Lansdale, until July 1 for the following supplies (separate bids to be submitted): Contract for Mazda lamps, 4000 ft. No. 2 6000 ft. No. 6, 3000 ft. No. 8, 3000 ft. No. 10, B. & S. gage, triple-braided copper wire, 2000 lineal ft. Washington fir cross-arms (3¼ in. by 4¼ in.), 500 cross-arm braces (1¼ in. by ¼ in. by 28 in. long), 1000 carriage bolts (⅜ in. by 4 in. long), 600 steel pins (½ in. by 9½ in.), including 4½-in. locust-wood tops—all of the above to be galvanized by the heat process; 2500 ft. arc-lamp cord (⅜ in. in diameter), two barrels Kempo wedge knobs to take No. 14 and No. 12 wire, porcelain tubes in barrel lots, six duplex mast arms, 12 ft. long, galvanized, miscellaneous pipe covering; also 25-ft., 30-ft. and 35-ft (8-in. top) chestnut poles. For details see proposal columns. Peter S. Dirks is superintendent of municipal electric-light plant.

LOYALSOCK, PA.—Property owners in Vallamont have petitioned the Supervisors of Loyalsock Township for the installation of a street-lighting system. The plans provide for the initial installation of 35 incandescent lamps and more later.

PHILADELPHIA, PA.—The contract for the construction of the building on the Parkway at the intersection of Seventeenth Street for the Bell Tel. Co. has been awarded to Cramp & Co. The building will be 157 ft. by 68 ft., 15 stories high, and will cost about $2,000,000 with equipment.

PITTSBURGH, PA.—Contract has been awarded by the Duquesne Lt. Co., of Pittsburgh, for the construction of a new substation on Warrington Avenue, near the south end of the Mount Washington tunnel, to cost about $15,000.

WASHINGTON, PA.—The Borough Council has granted the Relief El. Lt., Ht. & Pwr. Co. a franchise to furnish electricity in this borough. This is the second franchise granted the company. The former ordinance granting the company a franchise was vetoed by the Burgess and failed to pass the Council over the veto.

WILMERDING, PA.—Work has begun on the construction of a new power house on Fourth Street, Wilmerding, for the United El. Co.

WINBER, PA.—Plans have been completed by the Winber Tel. Co. for the installation of an entire new telephone system, including the erection of about 4 miles of new poles, installation of a new switchboard and new cables.

ATLANTIC CITY, N. J.—The Board of Public Utility Commissioners has granted the petition of the Atlantic City El. Co. to issue $103,000 in bonds, the proceeds to be used for fixed capital expenditures to plant and equipment.

FREEHOLD, N. J.—The Monmouth Ltg. Co., of Freehold, expects to erect within the next three months 10 miles of three-phase transmission line. The work will probably be given out by contract.

NEWARK, N. J.—The Shade Tree Commission has made an appropriation in its adopted budget of $3,000 for new lamps in Military Park.

NEWARK, N. J.—The contract for the tunnels and foundations in connection with the proposed eight-story terminal building which the Public Service Corpn. is to erect in Newark has been awarded to Holbrook, Cabot & Rollins Corpn., of New York. Proposals will soon be asked for construction of the building. The cost of the terminal complete, including track changes, is estimated at about $5,000,000.

ORANGE, N. J.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 10 for construction, including mechanical equipment and approaches, of the United States post office at Orange, N. J. Drawings and specifications may be obtained from the above office or from the custodian of site at Orange, or from York & Sawyer, architects, 50 East Forty-first Street, New York, N. Y. O. Wenderoth is supervising architect.

WASHINGTON, N. J.—Within the next three months the Washington El. Co. expects to build a new coal-handling system. The company has recently installed a 16-in. by 36-in. Hughes & Phillips Corliss engine, to replace two high-speed engines. Theodore Haldeman is superintendent.

BALTIMORE, MD.—The Pennsylvania Wtr. & Pwr. Co., of Holtwood, has awarded the contract for the construction of addition to substation on Philadelphia Road to the B. F. Bennett Building Co., 123 Howard Street, Baltimore. The building will be about 50 ft. by 54 ft., of brick and concrete construction.

BALTIMORE, MD.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 8 for repairs and additions to heating systems in the United States post office, court house, etc., in Baltimore. For details see proposal columns. O. Wenderoth is supervising architect.

CUMBERLAND, MD.—Preparations are being made by the N. & G. Taylor Co., of Cumberland, Md., for enlarging its plant, at a cost of $100,000, which will include a steel building 80 ft. by 100 ft., an additional 25-ton open-hearth furnace with a 40-ton overhead traveling crane and a 3-ton charging machine; also the installation of a 300-kw generator directly connected to a 500-hp engine in the power house.

EASTON, MD.—Bids will be received at the office of the Easton Electric Commission until July 8 for furnishing equipment and material for municipal electric-light plant as follows: engines, generators, switchboard, boilers, stack, feed-water heater, piping and pumps, changes to building, pole line and street-lighting equipment, in accordance with plans and speci-

fications prepared by the Reliance Engineering Co., Fourth National Bank Building, Cincinnati, Ohio. For details see proposal columns. L. H. Chaffinch is president of commission.

THURMONT, MD.—The Burgess and Borough Council are considering the question of purchasing from the Hagerstown & Frederick Ry. Co., of Frederick, electrical energy for commercial and residential lighting and also for street-lighting, at least during the low-water periods.

WILLIAMSPORT, MD.—At a special election held recently the proposal to issue $40,000 in bonds for the installation of a municipal electric-light plant in Williamsport was defeated.

ABINGTON, VA.—The city of Abington, it is reported, has contracted with the Bristol Gas & El. Co., of Bristol, Tenn.-Va., for furnishing electricity for street-lighting and power purposes.

FREDERICKSBURG, VA.—The Spottsylvania Pwr. Co. has been organized to take over the Electric Generating Co., and Fredericksburg Pwr. Co., of Fredericksburg, and the Virginia Lt. & Pwr. Co., of Ashland, Va. The maximum capital stock is placed at $2,000,000. The officers are: William C. Whitner, of Rock Hill, S. C.; H. G. Northrop, of Fredericksburg, vice-president and treasurer, and G. B. Williams, of Richmond, secretary. The principal office of the company will be in Fredericksburg.

MENDOTA, VA.—The installation of an electric-lighting system is reported to be under consideration. J. C. Payne is Mayor.

WASHINGTON, D. C.—The Electrical Department of the District of Columbia is planning to install 1500-cp lamps on F and G Streets, between Seventh and G Streets, and on D Street between Seventh and Tenth Streets. Arc lamps are to be erected on Eighth, Ninth, Tenth, Eleventh, Twelfth, Thirteenth and Fourteenth Streets. Incandescent lamps of 100 cp are now being installed in the business district inclosed by G, I, Fifteenth and Seventh Streets.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until June 18, for furnishing 20,000 dry cells in accordance with Signal Corps specifications 221-F and drawings 99-7; batteries (two cells each) for calvary buzzers, in accordance with drawing 410 c-3; ¾-in. by 2½-in. miniature dry cells; No. 711, ever-ready, dry tungsten batteries (battery to have two cells instead of three) specifications 221-F. Captain Charles S. Wallace is chief signal officer.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until June 23, for furnishing at the various navy yards and naval stations the following supplies: Puget Sound, Wash., Schedule 6843—three three-motor, 5-ton bridge cranes. Brooklyn, N. Y., Schedule 6856—four hot-wire ammeters, 4500 ft. armored, double-conductor wire, miscellaneous magnet wire; Schedule 6855—16,000 ft. rubber-covered wire; Schedule 6886—20,000 ft. armored and leaded, steel, twin-conductor wire. Philadelphia, Pa., Schedule 6866—400 lb. hard-bar copper, 2700 lb. sheet copper. Bids will also be received at the same place until June 30 as follows: Philadelphia, Pa., Schedule 6861—miscellaneous three-conductor potheads, miscellaneous panel and switches, 470 ft. three-conductor wire, 880 lb. bare copper wire; Schedule 6878—two 200-kw generating sets. Portsmouth, N. H., Boston, Mass., Brooklyn, N. Y., Philadelphia, Pa., and Norfolk, Va.—annual supply of boiler compound as per Schedule 6893. Bids will also be received until July 14 as follows: Mare Island, Cal., Schedule 6851—miscellaneous generating sets and spare parts. Brooklyn, N. Y., Schedule 6881—three fire-room hoist engines. T. J. Cowie is paymaster general of U. S. N.

North Central

DETROIT, MICH.—The contract for laying conduits for the Public Lighting Commission and the Detroit Fire Department on Cass, Second and Third Avenues under the new viaducts of the Michigan Central and Grand Trunk Railway crossings has been awarded to Frank H. Davis.

FLINT, MICH.—The City Council has instructed the city electrician to prepare plans, estimates of cost, etc., providing for the installation of underground conduits for electric wires on Saginaw Street.

GRAND RAPIDS, MICH.—Four electric elevators will be installed in the new building being erected by the Manufacturers' Realty Co. in Grand Rapids, to be occupied by the American Paper Box Board Co.

ISHPEMING, MICH.—The Northern Michigan Pwr. Co., incorporated in Maine, with headquarters in New York, N. Y., has filed articles of incorporation with the Secretary of State at Lansing. The headquarters in this State are in Ishpeming. The company is capitalized at $6,000,000. William P. Belden, of Ishpeming, is president.

OSSEO, MICH.—If sufficient patronage can be secured to warrant the expense, electricity will be furnished in Osseo from the municipal electric-light plant in Hillsdale, 6 miles distant.

BLUFFTON, OHIO.—The Western Ohio R. R. Co., of Lima, has submitted a proposal to the Town Council offering to furnish electricity for lamps and motors in Bluffton. Improvements to the municipal electric-light plant, it is understood, are contemplated.

CEDARVILLE, OHIO.—The Cedarville Lt. & Pwr. Co. is planning to erect a large steam-turbine plant in Cedarville. The company furnishes electricity in Clifton and Yellow Springs as well as Cedarville.

CINCINNATI OHIO.—Plans are being considered by the Main Street Merchants' Association for the installation of an ornamental street-lighting system on Main Street.

DAYTON, OHIO.—Plans are being considered by the Carrmonte Improvement Association, of Carrmonte, situated near Dayton, for the installation of an electric-lighting system.

MIDDLEPORT, OHIO.—F. C. Elliott, of Chicago, Ill., trustee, has purchased the property of the Mutual El. Lt. Co., of Middleport. It is understood that a connection will be made at once with the large plant owned by Martin Ebersbach in order to serve the local field until the high-tension transmission lines can be connected with the central power station in the Hocking Valley.

PAINESVILLE, OHIO.—As yet nothing definite has been decided in regard to the installation of an ornamental lighting system in Painesville. Reported in the issue of May 16 to be preparing plans for the installation of an electric-lighting system. Chester Hard is superintendent of the municipal electric-light plant.

RUSHSYLVANIA, OHIO.—The Village Council has granted William S. Lehrer a franchise to construct and operate an electric-light plant in Rushsylvania.

SEBRING, OHIO.—The McKee Lt. & Pwr. Co., of Sebring, has applied to the City Council for permission to erect 18 of the new type C lamps on Fifteenth Street between Pennsylvania Avenue and Maryland Avenue. In presenting this request the company asks for a new franchise.

SEVILLE, OHIO.—Bids will be received by S. D. Hall, village clerk, until June 22 for an electric distribution system in Seville.

SIDNEY, OHIO.—The property of the Sidney El. Co. is reported to have been purchased by the Albert Emanuel Co., of Dayton. E. D. Elwell will continue as manager.

ASHLAND, KY.—Rufus Vinsant, of Ashland, and others, it is reported, are interested in a project to install an electric-light plant and water-works system in Ashland.

BARBOURVILLE, KY.—The City Council has passed an ordinance providing for the installation of new street-lighting. The Barbourville El. Lt., Ht. & Pwr. Co. is rebuilding its plant and will furnish electricity for power purposes when completed.

CADIZ, KY.—George L. Smith and Stanley White have been granted a franchise to install and operate an electric-light plant in Cadiz. The proposed plant will be operated by water-power.

LOUISVILLE, KY.—William Schuff & Co., of Louisville, have decided to discard steam power and equip their tannery with electrically operated machinery. About 250 hp will be required, which will be obtained from the Louisville Gas & El. Co.

CHARLESTOWN, IND.—The Town Board has entered into a new contract with the Louisville & Northern El. Ry. & Ltg. Co. The contract provides for replacing the present arc lamps, of which there are 35, with 55 tungsten lamps of 80 cp.

EVANSVILLE, IND.—Bids will be received by the Board of Public Works, Evansville, until June 29 for lighting the streets and other public places with electricity and gas, and for furnishing electricity and gas for use in public buildings. For details see proposals columns. Edward N. Frisse is clerk.

FRANKFORT, IND.—Within the next 12 months the electric light committee expects to purchase an ash-handling system and one 75-lamp, 6.6-amp. mercury rectifier for series arc lamps. The committee has also under consideration the use of a synchronous motor to improve the power-factor. R. W. Hendrix is secretary.

INDIANAPOLIS, IND.—The Firestone Tire & Rubber Co., of Indianapolis, it is reported, will erect an addition to its plant. One extension will be 60 ft. by 120 ft., five stories, and the other 140 ft. A new 4000-kw generator with steam turbine will be installed and the present switchboard replaced by a new gallery board 70 ft. in length.

EVANSTON, ILL.—The Northwestern University, it is reported, is contemplating the installation of an electric-light plant.

JOLIET, ILL.—Improvements involving an expenditure of $60,500 are to be made to the municipal electric-light plant and will include the installation of one triplex plunger pump, one 40-hp motor, three Harris air lifts, one artesian well, replacing smokestacks at water plant, two motor-driven compressors, complete on foundations for water-works plant, and one 4,000,000-gal. concrete reservoir. C. D. O'Callahan is city clerk.

KEENSBURG, ILL.—The Mount Carmel Pub. Utility & Ser. Co., of Mount Carmel, is considering the question of extending its service to Keensburg.

BELDENVILLE, WIS.—The installation of an electric-lighting system in Beldenville is under consideration. H. O. Junkman is reported to be interested in the project.

FREDONIA, WIS.—L. H. Schmitz, it is reported, is contemplating installing an electric-light plant in Fredonia.

HIBBING, MINN.—The Water and Light Board has instructed E. B. Jackson, consulting engineer, of St. Paul, to prepare plans for the construction of a heating plant, to cost $10,000, to be operated in connection with the proposed new electric plant.

MURDOCK, MINN.—Plans are being considered for the installation of an electric-lighting system in Murdock.

RED CLOUD, MINN.—The electric light commissioners expect to purchase a small amount of wire and supplies for distribution system. Guy Zeigler is superintendent.

SPRINGFIELD, MINN.—A committee, consisting of Mayor Rieck, A. C. Ochs and Oscar Erickson, has been appointed to make investigation relative to the cost of the installation of a new municipal electric-light plant. The installation of an ornamental street-lighting system in the business section is under consideration. George P. Forster is chairman of the committee in charge of the proposed lighting system.

VILLARD, MINN.—Bonds to the amount of $5,000 have been voted for the installation of an electric-lighting system in Villard.

CEDAR RAPIDS, IA.—The contract for electric wiring for the Hayes grade school has been awarded to C. E. Fawcett, of Cedar Rapids, at $4,030; for generator set to the Ridgeway Dynamo & Engine Co., of Ridgeway, Pa., at $3,020.

CHARLES CITY, IA.—The Charles City Ltg. & Htg. Co., of Charles City, has changed its name to the Cedar Valley Pwr. Co. and has purchased plants or obtained franchises in the following towns: Nashua, Clarksville, Bristow, Allison, Dumont, Parkersburg, Hampton, Chapin, Sheffield and Rockwell, and will furnish electricity to these towns as soon as possible; the company also expects to extend its service to other towns. The capital stock of the company is placed at $1,000,000. The officers are: H. H. Caughlan, of Waterloo, president; M. A. Harrison, of Hampton, vice-president, and A. L. Dodd, of Charles City, secretary and general manager.

DUBUQUE, IA.—Steps have been taken by the Traveling Men's Greater Dubuque Club for extending the ornamental lighting system the entire length of Main Street.

LINN GROVE, IA.—At a special election held recently the proposal to grant the Peterson Pwr. & Lt. Co. a 25-year franchise to furnish electricity in Linn Grove was carried.

WAUCOMA, IA.—Contracts have been awarded by the Town Council for the construction of dam, flumes, equipment, etc., for the proposed municipal electric-light plant, as follows: For construction of concrete dam and concrete work to Chambers & Dobson, of New Hampton; water-wheels or turbines to James Leffel & Co., of Springfield, Ohio; switchboard and line material to Julius Andrae & Sons Co., of Milwaukee, Wis., and pole-line construction to C. E. Mackey, of Waverly.

WYOMING, IA.—At an election to be held June 20 the proposal to grant the local electric light company a renewal of its franchise will be submitted to the voters. The franchise does not expire for several years.

but the company is contemplating extensive improvements to its system, provided the extension of franchise is granted.

HOPKINS, MO.—Within the next two months the Hopkins El. Lt. & Ice Co. expects to build an electric-light plant complete, including distribution lines and transformers; also to purchase one 65-hp oil engine, one 45-kw or 50-kw, three-phase, 2300-volt alternator, with exciter and switchboard; material for distribution line, including about 300 poles and 100 meters; one 4-kw, 6.6-amp transformer for street-lighting system with switchboard panel. When improvements are completed a 24-hour service will be established and the company is expecting to use a number of motors, irons, cooking apparatus and other household devices. G. D. Henderson is manager and engineer.

KANSAS CITY, MO.—The Dorn-Cloney Laundry Co., of Kansas City, will not build its power plant until next year. Reported in the issue of May 23 to be contemplating the installation of a power plant.

LA PLATA, MO.—The La Plata Lt. & Pwr. Co. expects to purchase within the next four months one car load of poles and 50 meters. J. M. Atkinson is manager.

SEDALIA, MO.—The City Lt. & Trac. Co., of Sedalia, is installing a La Blanc condenser and cooling tower. Harry D. Frueauff is treasurer and manager.

TOWER CITY, MO.—Plans, it is reported, are being prepared by Aiken & Barlett, of Fargo, for the installation of an electric-light plant in Tower City.

WIMBLEDON, N. D.—The Wimbledon El. Co., recently incorporated with a capital stock of $10,000, will soon begin work on the construction of an electric-light plant to be installed in the Wimbledon Motor Co.'s garage. F. H. Etter, Robert Clendening and others are interested in the company.

ARMOUR, S. D.—The new central power plant of the Interstate Pwr. Co., it is reported, will be situated in Armour. Material is now being ordered. The new plant will furnish electricity in Scotland, Platte and Wagner. A 24-hour service will be furnished to all towns on the circuit when the plant is completed. J. F. Cameron is manager of the Dakota plants.

ARTESIAN, S. D.—A. G. Schuler, president of the Schuler El. Co., of Woonsocket, has submitted a proposal to the Town Council offering to furnish electrical service in Artesian from its plant in Woonsocket. It is proposed to install a larger plant in Woonsocket.

ALLIANCE, NEB.—The city of Alliance is considering the purchase of a 12-kva constant-current transformer, 80 central support fixtures, wires and other material for series tungsten street-lighting system; also to purchase a pump with capacity of 1000-gal. per minute, and to build a 500,000-gal. reservoir. J. E. Hughes is superintendent.

FAIRBURY, NEB.—The Electric Light Commissioners expect to purchase within the next three months one 75-kw alternator (Red Fields, 720 r.p.m.) and switchboard. G. D. Myers is superintendent.

MEAD, NEB.—Bids will be received until June 26 for construction of an electric-light plant and water-works system, to cost about $13,000. Bruce & Standevin, 430 Bee Building, Omaha, are engineers.

PRAGUE, NEB.—Within the next five months the village of Prague expects to erect a new tower house (concrete-block building). Anton Kaspar is village clerk.

BARNES, KAN.—The installation of an electric-light plant in Barnes is reported to be under consideration. The cost of the system is estimated at $5,000.

VALLEY FALLS, KAN.—The Valley Falls El. Lt. Co. is installing an oil engine and adding another generator to its plant. Reported in the issue of May 30 that the City Council was planning to make improvements to plant. H. Swartz is proprietor of plant.

WELLSVILLE, KAN.—The contract for construction of the new electric-light plant in Wellsville has been awarded to the Bushong Electrical Works, of Ottawa, to cost about $7,000. C. A. Smith, of Wellsville, is proprietor.

Southern States

BAT CAVE, N. C.—J. T. Patrick, of Bat Cave, it is reported, contemplates the construction of a hydroelectric plant and will require equipment for same.

SCOTLAND NECK, N. C.—Plans are being prepared by L. R. Mills, superintendent of the municipal electric-light plant, for increasing the output of the plant.

ALLENDALE, S. C.—The City Council has engaged the H. S. Jaudon Engineering Co., of Savannah, to take charge of the construction of the proposed electric-light plant, water-works and sewer systems, for which $65,000 in bonds was recently voted. E. H. Oswald is chairman of Public Works Commission.

BATESBURG, S. C.—Plans, it is reported, are being prepared by the J. B. McCrary Co., of Atlanta, Ga., for electric-light plant, water-works and sewer systems, to cost about $25,000.

PORT ROYAL, S. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, S. C., until June 27 for furnishing and installing one boiler-feed water purification system with an open-type feed-water heater in the central power plant at the Naval Disciplinary Barracks, Port Royal, S. C. Plans and specifications may be obtained on application to the bureau. H. R. Stanford is chief of bureau.

PROSPERITY, S. C.—The city of Prosperity, it is reported, has engaged the J. B. McCrary Co., of Atlanta, Ga., to prepare plans for the construction of an electric-light plant, to cost about $10,000.

ATHENS, GA.—The Athens Mfg. Co. contemplates making improvements to its water-power plant. J. D. Moss is president.

BALL GROUND, GA.—The Amicola Marble Co., of Ball Ground, it is reported, has purchased a water-power site on the Etowah River at Gober Station, about 3 miles from Ball Ground, where it will install a hydroelectric power plant, to develop about 500 hp. It is understood that the present dam and grist mill now on site will be used. Electricity generated at the plant will be used to operate the marble works of the company and other industries in Ball Ground, also for street-lighting and to operate the pumping station for the town.

CHATSWORTH, GA.—The city of Chatsworth has engaged the J. B. McCrary Co., of Atlanta, to prepare plans for electric-light plant and water-works system.

REYNOLDS, GA.—The City Council is considering the question of installing a municipal electric-light plant. The plans provide a gasoline engine and 100 lamps of 100 cp for street-lighting system. G. L. Cooper is secretary and treasurer.

PUNTA GORDA, FLA.—Bids will be received by J. F. Corbett, clerk of the Board of Bond Trustees, until June 30 for the installation of a 30-kva, 60-cycle, three-phase, 2300-volt, belted type generator, with pulley, rails and rheostat; a 2-kw, 115-volt direct-current exciter; Blue Vernon marble switchboard, with instruments; 20-ft. line shaft with hangers, collars and pulleys; vertical-type oil engine, complete with fuel tanks, pipe and fittings, exhaust pot, magneto battery and necessary tools, oilers, etc.; 7-in. x 10-in. duplex power pump, having a capacity of 330 gal. per minute, to be installed on foundations furnished by the town.

CHATTANOOGA, TENN.—Bids will be received by the city of Chattanooga until July 10 for lighting the streets and parks of the city for a period of five years. The contract with the Chattanooga Ry. & Lt. Co. expires in the fall.

FULTON, TENN.—Preparations are being made for the installation of an electric-lighting system, water-works and sewerage system in South Fulton, to cost about $45,000. R. C. Huston & Co., Exchange Building, Memphis, are engineers in charge.

OOLTEWAH, TENN.—The installation of an electric-light plant and waterworks system in Ooltewah is under consideration.

UNIONTOWN, ALA.—Within the next few months the Water and Light Department expects to purchase about 200 water meters. T. C. Collier is engineer.

BERWICK, LA.—At an election held recently the proposal to establish a municipal electric-light plant in Berwick was carried.

BROWNSVILLE, TEX.—It is reported that Albert A. Browne and associates, who have recently purchased the Rio Grande Railroad, which runs from Brownsville to Point Isabel, a distance of 22 miles, and the local street-railway system, contemplate the construction of an electric power plant to furnish electricity to operate the combined system. Gasoline motors are now used on the cars, but the new owners will equip the lines for electrical operation.

NEWSOME, TEX.—The installation of an electric-light plant in Newsome is under consideration. F. M. Streetman is reported interested in the project.

VICTORIA, TEX.—The property of the Victoria Mfg. Co., owned by John J. Welder, which furnishes electricity in Victoria, has been purchased by the South Texas El. Co., of Boston, Mass. The new owners, it is understood, contemplate a street railway system for Victoria.

Pacific States

BLAINE, WASH.—Improvements are contemplated by the Farmers' Mutual Tel. Co. to the local system, to cost about $10,000. The work will include a new switchboard and a cable system.

EVERETT, WASH.—The Florida Land Co., which owns a large tract of land at Beverly Park, has announced its intention of installing an electric-lighting system in that section of the city, electricity for which will be supplied by the Everett Ry., Lt. & Pwr. Co. The latter company has recently petitioned the County Commissioners for a franchise to erect a transmission line from the Interurban Road to Beverly Park, and if granted, the work will be completed this summer.

HUSUM, WASH.—The Northwestern El. Co., of Portland, Ore., it is reported, will build a new concrete dam on the White Salmon River this year for electrical development.

SEATTLE, WASH.—J. D. Ross, superintendent of lighting, recently notified the County Commissioners of King County that the city of Seattle would immediately make use for power transmission of its common-user rights over the poles of the Puget Sound Trac., Lt. & Pwr. Co. north of the city, bounded by Woodland Park Avenue and Evanston Avenue. This, it is understood, means that the transmission lines of the municipal electric-light system will be extended at once.

SEATTLE, WASH.—Bids will be received by the Board of County Commissioners of King County, Seattle, until June 29 for erection and completion of court house building, covering block 33 of C. D. Boren's addition to the city of Seattle. Plans and specifications may be obtained from A. Warren Gould, American Bank Building, upon deposit of $25.

SPOKANE, WASH.—The City Council is considering the installation of an ornamental electrolier lighting system on Main Avenue from Monroe Avenue to Division Street (the same system as recently installed on Riverside Drive).

BURNS, ORE.—The Harney El. Co., recently organized, proposes to take over the water rights filed by J. Edwin Johnson on the North Fork of the Malheur River, about 20 miles north of Drewsey. Energy developed will be used for irrigation purposes and for lamps, heaters and motors in Burns and Drewsey and surrounding territory. The company is capitalized at $250,000 and the headquarters will be in Burns.

DRAIN, ORE.—The city of Drain has voted bonds to the amount of $15,000 for the installation of a municipal hydro-electric light plant. The Council has not yet engaged an engineer or taken any action on the matter. George V. Sanders is city recorder.

PORTLAND, ORE.—Commissioner Daly will ask the City Council to recommend the appointment of an electrical engineer to make investigations of the feasibility and cost of establishing a municipal electric plant on one of two sites, both of which belong to the city, one capable of developing 10,000 hp and the other 30,000 hp, to furnish electricity for lighting the streets, public buildings, etc., of the city and also for commercial purposes. The present contract with the Portland Ry., Lt. & Pwr. Co. will expire in two and one-half years.

LOS ANGELES, CAL.—Bids will be received at the office of the United States Reclamation Service, Federal Building, Los Angeles, until July 14 for furnishing a variable-head turbine for the Salt River project. For particulars address the United States Reclamation Service at Los Angeles, Cal., or Washington, D. C. F. H. Newell is director.

LOS ANGELES, CAL.—Of the proceeds of the $6,500,000 power bonds voted May 8 for the completion of the aqueduct power project, approximately $1,250,000 will be used for completion of power plant, building a central receiving station in Los Angeles, and a transmission line from the plant to Los Angeles, for which equipment for material has been purchased; cable and insulators have also been purchased for the transmission line. Bids will be called at an early date for steel towers for transmission line. The $5,250,000 voted for the distributing system within the city is intended to be used for the purchase of existing lines already installed.

SANTA BARBARA, CAL.—Negotiations have practically been closed between J. T. Huntington, manager of the Santa Barbara Gas & El. Co., and the citizens of Carpinteria, whereby the former will furnish electricity for lamps and motors to the residents of the valley.

SAN FRANCISCO, CAL.—The electricity committee of the Board of Supervisors has decided to establish an additional district in which electric wires shall be placed underground.

ELK CITY, IDAHO.—Plans are being prepared for the erection of a hydroelectric power plant on the Red River, near Elk City. The proposed plant will develop from 700 hp to 1000 hp. Alfred Adams, Hunter B. Supplee, of Elk City, and others, are interested in the project.

IDAHO FALLS, IDAHO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 10 for construction, complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Idaho Falls, Idaho. Drawings and specifications may be obtained at the above office or from the custodian of site at Idaho Falls. O. Wenderoth is supervising architect.

MOSCOW, IDAHO.—The Washington Wtr. Pwr. Co., of Spokane, Wash., has applied to the Public Utilities Commission of Idaho for permission to extend its transmission lines connecting its power plants on the Spokane River with its distributing systems in Moscow, Genesee and Troy.

MANTUA, UTAH.—At an election held recently the proposal to install an electric-lighting system in Mantua was carried. Electricity for operating the system will be purchased from the electric plant in Brigham City. Mantua has not a post office.

MORGAN, UTAH.—The power plant of the Como Lt. & Pwr. Co., of Morgan, situated near the narrows in the Hard-Scrabble Canyon, has been purchased by the Utah Pwr. & Lt. Co.

NOGALES, ARIZ.—At an election held May 25 the proposal to grant S. S. Portor, of Nogales, and M. M. Mansfield, of Tucson, a franchise to supply electricity for lamps and motors in Nogales was carried.

SAFFORD, ARIZ.—The electric plant of the Gila Valley Lt., Pwr. & Wtr. Co., of Safford, was recently destroyed by fire. At present the town is without electrical service.

TUCSON, ARIZ.—Bids will be received at the office of L. O. Cowan, city clerk, until July 6 for 60 or more five-lamp and 26 or more single-lamp ornamental street-lamp standards, without globes or bulbs. The five-lamp standards to be equipped with a terminal block for four connections, the single-lamp standard to be equipped with a terminal block for two connections. Internal wiring arranged so that the lamps shall be connected in series and each pole equipped with a porcelain series socket.

LIVINGSTON, MONT.—The City Council is considering the installation of an ornamental street-lighting system and also a fire-alarm system. An election will be called in the near future to submit the proposal to the voters.

TRINIDAD, COL.—The officials of the St. Louis, Rocky Mountain & Pacific R. R. Co. in New Mexico have entered into a contract with the Trinidad El. Trans., Ry. & Gas Co., of Trinidad, to furnish electricity to the five mines owned by the railroad company at Brilliant, Gardiner, Sugarite, Van Houten and Koehler. The cost of erecting and equipping the transmission line to the mines is estimated at about $115,000. The city of Raton, N. M., will also purchase energy from the Trinidad company.

MAGDALENA, N. M.—The Magdalena Lt. & Pwr. Co. is building an electric-light and power, cold-storage and ice-manufacturing plant in Magdalena.

Canada

LACOMBE, ALTA.—A by-law will soon be submitted to the ratepayers asking for authority to purchase a boiler for the municipal electric-light plant.

PRINCE RUPERT, B. C.—The engineer engaged by the City Council to investigate the feasibility and cost of installing a municipal hydroelectric plant estimates the cost at $248,845, and that $22,320 would be required for electrical equipment. It is understood that preliminary steps toward construction will be taken at once.

WINNIPEG, MAN.—Tenders will be received by the Board of Control, Winnipeg, until June 18 for the supply of globes, electrodes, carbons, cut-outs, etc. Specifications may be seen at the office of J. C. Glassco, engineer, 54 King Street Winnipeg.

WINNIPEG, MAN.—J. G. Glassco, manager of the light and power department of the city of Winnipeg, writes that no addition to the ornamental lighting system is contemplated at this time. Reported in the issue of May 23 to be planning for extensions to the ornamental lighting system on Portage Avenue.

HALIFAX, N. S.—The Halifax El. Tramway Co., it is reported, contemplates the installation of a 2200-kw high-pressure turbo-generator set.

GANANOQUE, ONT.—The Gananoque El. Lt. & Wtr. Supply Co. has awarded a contract for an addition to its power house.

GRAVENHURST, ONT.—The Town Council has awarded the contract for the construction of a substation in Gravenhurst to Etler & Clift, of Gravenhurst.

RENFREW, ONT.—The Hydro-Electric Power Commission of Ontario has submitted an estimate of the cost of installing a street-lighting system in Renfrew, which is placed at about $16,000.

LACHINE, QUE.—A by-law for improvements, including a large sum for laying underground conduits, has been passed by the ratepayers.

MONTREAL, QUE.—Mr. Parent, superintendent of lighting for the city of Montreal, has submitted to the City Controllers a report of the cost of a municipal electric plant, to maintain 500 lamps for the central districts, in which the capital expenditure is placed at $172,667 and the annual operating expenses at $54,100, making the cost per lamp $108 per year. The report was compiled as the result of a disagreement with the Montreal Lt., Ht. & Pwr. Co. as to the cost of lighting the district by means of underground distribution, the controllers considering the price of $156 per lamp per annum asked by the company too high.

THREE RIVERS, QUE.—The City Council has engaged James Bennett, electrical engineer, Board of Trade, Montreal, to prepare plans for a new street-lighting system. It is proposed to replace the present arc lamps with new arc lamps erected on ornamental standards, to be maintained by underground wires. Electricity for operating the lamps will be supplied by the North Shore Pwr. Co. The Council is also considering the question of renewing the franchise for street and commercial lighting held by the North Shore Pwr. Co., of Three Rivers.

VAUDREUIL, QUE.—The Vaudreuil El. Co., a subsidiary of the Cedars Rapids Mfg. & Pwr. Co., is erecting a 12,000-volt, two-circuit pole transmission line from Cedars to Vaudreuil, a distance of 6 miles. The company is also erecting 2200-volt mains, street-series and 110-volt secondaries in Dorion and Vaudreuil villages, including a 12,000-volt cable crossing the Soulanges Canal with necessary substations. The company expects to furnish electrical service in Vaudreuil and Dorion by July 1, and will extend its lines to Cedars Village, Hudson, Como and Hudson Heights. The line will also be extended to Ottawa and other places on St. Lawrence River as required. Energy is at present being supplied by the Montreal Lt., Ht. & Pwr. Co. and will be until the Cedars plant is in operation.

VERDUN, QUE.—The Council has decided to place all wires in the central portion of the city underground, at a cost of about $500,000, to be completed in about five years.

CHAMBERLAIN, SASK.—Tenders are invited by F. R. Sanders, secretary of the Chamberlain Rural Tel. Co., of Chamberlain, for the installation of a telephone system.

STRASBURG, SASK.—Tenders will be received by V. G. Watkins, secretary of the East Mount Rural Tel. Co., of Strasburg, for the installation of a telephone system.

Miscellaneous

VALDEZ, ALASKA.—The capital stock of the Alaska Wtr., Lt. & Pwr. Co., of Valdez, has been increased from $100,000 to $250,000. The company contemplates extensive development work during the summer. S. A. Hemple is president of the company.

WELLINGTON, NEW ZEALAND.—Tenders are invited by the City Council of Wellington for furnishing and delivering an electric chassis for a 2000-lb. parcel delivery van and an electric motor car, required for the Electric Tramways Department. Copies of specifications, etc., may be obtained from the office of the Tramways Department and the electrical engineer, Harris Street, Wellington, N. Z., upon payment of $5.11 for each of the contracts, which will be refunded upon receipt of tender. Bids must be submitted by July 9, and local representation is necessary. Further information may be obtained from the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., and at branch office, 315 Custom House, New York, N. Y., by referring to No. 13,181.

New Incorporations

DOVER, DEL.—The Interstate Public Ser. Corpn. has filed articles of incorporation under the laws of the State of Delaware. The company is capitalized at $2,000,000 and purposes to operate and control public utilities. The incorporators are W. J. Maloney, O. J. Reichard and H. E. Latter, of Wilmington, Del.

QUINCY, ILL.—The Adams County Mississippi River Pwr. Distributing Co. has been granted a charter with a capital stock of $60,000 to generate and distribute electricity for lamps, heaters and motors. The incorporators are John M. Schoeneman, Edward H. Hedrick and Randall B. Echols.

LITTLE ROCK, IA.—The Little Rock El. Lt. Co. has been chartered with a capital stock of $10,000 to construct and operate an electric-light plant in Little Rock. Frank Turk is one of the incorporators.

ASHLAND, KY.—The Camden Pwr. Co. has been incorporated by John F Hager, J. W. M. Stewart and K. M. Fitzgerald. The company is capitalized at $100,000.

WIMBLEDON, N. D.—The Wimbledon El. Co. has been organized by F. H. Etter and others. The company is capitalized at $10,000 for the purpose of building a new plant.

HICO, TEX.—The Central Texas Pwr. & Transmission Co. has been granted a charter with a capital stock of $100,000. The incorporators are V. F. Wieser, H. Gleason and H. M. Weiser.

KINGSTON, WIS.—The Kingston El. Co. has been incorporated with a capital stock of $2,000 by L. A. Very, O. A. Oestreich and Leora Westlake.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JUNE 2, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,098,372. TELEPHONE APPARATUS; A. H. Dyson, Chicago, Ill. App. filed July 13, 1903. For selectively signaling any one of a number of operators at central station.

1,098,379. SYSTEM OF SELECTIVE CONTROL; J. H. Hammond, Jr., Gloucester, Mass. App. filed Sept. 7, 1911. Ether disturbances of predetermined frequencies are received selectively by receiving station.

1,098,380. AUTOMATIC TICKER RECEIVER; J. H. Hammond, Jr., Gloucester, Mass. App. filed Aug. 24, 1912. Automatic ticker for an undamped electric wave receiver.

1,098,431. MAGNETO-ELECTRIC GENERATOR; R. H. Cunningham, New York, N. Y. App. filed Oct. 8, 1912. For ignition purposes; has armature pole pieces arranged convergent on one side and divergent on the other side and asymmetrical.

1,098,436. ELECTRIC HEATING SYSTEM; W. S. Hadaway, Jr., New York, N. Y. App. filed Sept. 5, 1911. The steel and concrete elements of the building structure utilized for heating elements.

1,098,437. ELECTRIC HEATING DEVICE; W. S. Hadaway, Jr., New York, N. Y. App. filed Sept. 13, 1911. Soldering iron with heating unit inclosed and protected from fluxes.

1,098,447. CALLING DEVICE; W. Kaisling, Chicago, Ill. App. filed Nov. 6, 1911. For metallic-circuit telephone systems.

1,098,452. INDUCTOR-MAGNETO ALTERNATOR; L. J. Le Pontois, New Rochelle, N. Y. App. filed July 11, 1908. Has an exciting winding on the permanently magnetized field element.

1,098,456. TROLLEY HARP; J. W. McKinney, Tyrone, Pa. App. filed May 24, 1913. Novel detachable connection between the harp and the trolley pole.

1,098,478. ATTACHMENT PLUG FOR ELECTRIC CIRCUITS; F. H. Chapman and O. E. Kenney, Toledo, Ohio. App. filed June 13, 1913. Lock for plug and socket couplings.

1,098,490. THERMOSTATICALLY OPERATED CIRCUIT-BREAKER; T. R. Fagan, Huntington, W. Va. App. filed July 19, 1913. Particularly for dental furnaces and vulcanizing devices.

1,098,493. ELECTRICAL ATTACHMENT FOR HAY PRESSES; W. D. Gladney, Silex, Mo. App. filed Aug. 27, 1913. Bell automatically rung when each bale is completed.

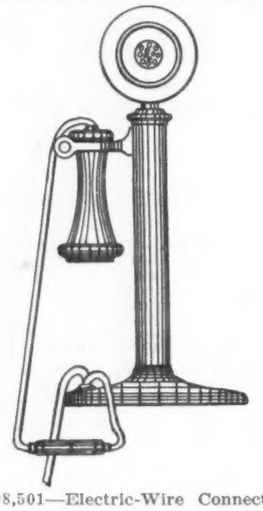
1,098,501. ELECTRIC WIRE CONNECTION; H. H. Holdaway and A. C. Candland, Salt Lake City, Utah. App. filed May 20, 1912. For preventing twisting of flexible telephone cord.

1,098,521. AUTOMATIC RECORDER FOR CALL BOXES AND FIRE ALARMS; J. D. Nelson, Cincinnati, Ohio. App. filed June 25, 1910. Records time and box from which call is sent.

1,098,528. TELEPHONY AND TELEGRAPHY FOR MINING CAGES; J. H. Reineke, Bochum, Germany. App. filed Aug. 24, 1912. Uses the cage-hoisting cables as conductors.

1,098,529. MULTIPLE-BRUSH SELECTOR; J. N. Reynolds, Greenwich, Conn. App. filed Nov. 16, 1912. For automatic and semi-automatic telephone systems.

1,098,539. INTERNAL-COMBUSTION ENGINE; J. A. Williams, Cleveland, Ohio. App. filed Dec. 19, 1910. Two-cycle; at low speed causes charges to be ignited at each alternate compression stroke.



1,098,501—Electric-Wire Connection

1,098,549. TRANSFORMER; T. E. Barnum, Milwaukee, Wis. App. filed May 15, 1911. Adjustable, for arc lamps.

1,098,550. ELECTRIC WELDING MACHINE; F. E. Beam, Toledo, Ohio. App. filed Nov. 27, 1911. For rings of rectangular or other shape.

1,098,557. ROTARY CONVERTER; S. M. Burk, Philadelphia, Pa. App. filed July 20, 1912. Commutator for transforming alternating current into direct current or vice versa.

1,098,573. HEATER; M. Hauser, Jr., Kansas City, Mo. App. filed April 7, 1913. For heating water in a radiator.

1,098,592. ILLUMINATING DEVICE; E. O. Schweitzer, Chicago, Ill. App. filed March 4, 1912. Lamp base with spark-gap to form a bridge about the lamp.

1,098,602. BALING-PRESS ALARM; C. R. Warman, Newark, Ohio. App. filed Oct. 7, 1913. Alarm sounded when bale is tied and is being forced from baling chamber.

1,098,604. LIGHTER; R. E. Wing, Detroit, Mich. App. filed Jan. 16, 1914. Electric lighter for gas water heater.

1,098,606. ELECTRIC BATTERY; E. Achenbach, Hamburg, Germany. App. filed Feb. 6, 1913. Mercuric oxide is added to the manganese-graphite mass.

1,098,617. ELECTRICAL APPARATUS FOR TRANSMITTING AND RECEIVING SIGNALS; A. T. Dawson and G. T. Buckham, Westminster, London, Eng. App. filed Dec. 31, 1912. Step-by-step motors operating endless chains carrying a pointer or the like.

1,098,628. PISTOL FLASHLIGHT; H. Hyman, Brooklyn, N. Y. App. filed Nov. 28, 1913. Casing in half-sections hinged together, and the trigger controls the circuit.

1,098,632. ELECTRIC SPOT-WELDING MACHINE; F. P. McBerty, Warren, Ohio. App. filed Sept. 30, 1912. Vertically disposed horn carried by a vertically displaceable arm supports an electrode cooperating with a fixed electrode.

1,098,649. CONSTANT-CURRENT REGULATOR; A. A. Tirrill, Schenectady, N. Y. App. filed Dec. 14, 1907. Controls both the direction and amount of magnetomotive force developed in the field of the booster.

1,098,656. ALTERNATING-CURRENT MOTOR CONTROL; E. F. W. Alexanderson, Schenectady, N. Y. App. filed Jan. 6, 1910. For operating motors on single-phase or multiphase currents.

1,098,661. CURRENT COLLECTOR; F. E. Case, Schenectady, N. Y. App. filed Aug. 1, 1906. Automatic means for retracting and restoring the collector to operative position.

1,098,664. INSTRUMENT TRANSFORMER; M. D. Dobrowolsky, Wilmersdorf, Germany. App. filed Sept. 4, 1912. Each conductor is provided with a magnetic path.

1,098,666. ELECTRIC BRUSH; J. Graves, Milwaukee, Wis. App. filed Oct. 3, 1911. Battery in handle, and bristles always in circuit even when they yield.

1,098,698. ELECTRIC-RAILWAY TROLLEY; J. A. Walsh, Rochester, N. Y. App. filed Oct. 20, 1913. Grooved roll in rear of trolley wheel engages wire when wheel leaves wire.

1,098,717. OVERHEAD-TROLLEY CONSTRUCTION; G. Gibbs, New York, N. Y. App. filed July 11, 1908. Trolley wire for siding is lowered so as to be engaged only when car is to pass onto siding.

1,098,718. RHEOSTAT; A. I. Grabham, Wellington, New Zealand. App. filed Nov. 8, 1912. Has resistance block of manganese oxide, zinc oxide, silicate of soda and brass filings, mixed together.

1,098,738. LIGHTNING ROD; S. D. Kretzer, St. Louis, Mo. App. filed July 9, 1913. Supplemental ground circuit to which points are connected and provided with down leads extended into earth.

1,098,741. ELECTRIC LAMP PUSH SOCKET; L. F. Lindstrom, Bridgeport, Conn. App. filed Aug. 2, 1912. Operated by push-button extending out through guide in one side of the shell.

1,098,753. ELECTRIC GENERATOR FOR IGNITION SYSTEMS; E. Podlesak, Tiffin, Ohio. App. filed June 10, 1911. Special field aud pole structure, inclosed armature.

1,098,754. INDUCTOR ALTERNATOR; E. Podlesak, Tiffin, Ohio. App. filed July 21, 1911. Especially for make-and-break ignition.

1,098,772. SIGNAL OR ALARM DEVICE; W. M. Waite, Syracuse, N. Y., and J. H. Wheelock, Worcester, Mass. App. filed March 24, 1913. Has rotary conducting member with insulating plugs inserted in its surface and brushes bearing on same.

1,098,775. BUSHING FOR ELECTRIC TUBULAR INSULATION; C. M. Wheelock, Milwaukee, Wis. App. filed Nov. 16, 1912. For securing circular loom where it passes through the wall of a cut-out box or the like.

1,098,778. CIRCUIT CONTROLLER; H. P. Ball, Pittsfield, Mass., and G. Wright, Schenectady, N. Y. App. filed Dec. 22, 1908. Non-closable on overload.

1,098,779. CONCEALED WIRE-SUPPORTING CHAIN; W. H. Blake, Boston, Mass. App. filed Oct. 18, 1912. Wires are passed only through the alternate links.

1,098,780. MOTOR-STARTING DEVICE; P. Caldwell, Pittsburgh, Pa. App. filed April 5, 1913. Embodies manually operated line switch and overload circuit-breaker.

1,098,794. ARTICLE WITH PROTECTIVE COATING; S. H. Fleming, Cleveland, Ohio. App. filed Oct. 29, 1912. Electrode with coating of titanium nitride.

1,098,801. SPIRIT LEVEL; W. J. Hughes, Chicago, Ill. App. filed Dec. 27, 1913. With flashlight mounted in pocket in the stock.

1,098,807. RECTIFIER; A. T. Kasley, Pittsburgh, Pa. App. filed May 7, 1910. Constant stream of mercury is periodically blown away from terminal by air currents.

1,098,809. RAILWAY SWITCH THROWING MECHANISM; H. C. Kinsel, Altoona, Pa. App. filed June 24, 1913. Embodying a rack and an electromagnetically operated toothed member.

1,098,834. ELECTRIC BELL; S. Oliver, Chicago, Ill. App. filed Oct. 9, 1913. Alternating-current bell with no permanent magnet and no contact points.

1,098,845. ELEVATOR; M. C. Schwab, Chicago, Ill. App. filed Oct. 24, 1910. Counter-weight is locked so as to sustain positively the car and disable the motor upon occurrence of abnormal conditions.

1,098,852. ELECTRIC PERMUTATION-LOCK SWITCH; G. Stupar, Chicago, Ill. App. filed Dec. 6, 1912. Alarm is rung if false step occurs in operating lock.

1,098,859. PRODUCING ISOPRENE; F. Webel, Mannheim, Germany. App. filed Feb. 27, 1913. Treats methyl-butenol ester at raised temperature when vaporized with alumina.

1,098,871. GALVANOMETER; J. L. Zander, Newark, N. J. App. filed April 30, 1912. One of the coils returns the shaft to normal position, thereby dispensing with returning spring.

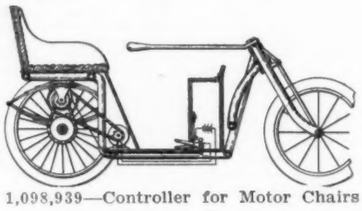
1,098,893. ELECTRICALLY OPERATED VIBRATOR; J. L. Dinsmoor, New York, N. Y. App. filed Nov. 14, 1912. Sparking avoided by shunting from one coil to the other; no absolute breaks in circuit.

1,098,939. CONTROLLER FOR MOTOR CHAIRS; C. B. Chrysler, Chicago, Ill. App. filed Dec. 9, 1912. Interconnected motor and brake foot pedals.

1,098,983. ELECTRIC MUSICAL INSTRUMENT; M. L. Severy, Arlington Heights, and G. B. Sinclair, Medford, Mass. App. filed Aug. 7, 1905. Electromagnets vibrate a tuned sonorous body, rotative pulsator for magnets and synchronizer for the motor which rotates the pulsator.

1,099,022. TROLLEY WHEEL; T. Cavanaugh, Pittsburgh, Pa. App. filed May 17, 1912. Coiled springs encircling the wheel normally overhang the wire channel in the wheel.

1,099,062. ELECTRIC SCALP APPLIANCE; P. P. Laposkey, Cherokee, Ia. App. filed Dec. 10, 1913. Rubber cap with insulated plates carrying metal scalp-engaging pins.



1,098,939—Controller for Motor Chairs

1,099,071. RHEOSTAT; J. A. McCoy, Jr., Parkersburg, W. Va. App. filed July 23, 1913. Made from a plastic mass of graphite and an asbestos compound.

1,099,090. TERMINAL DEVICE; W. G. Houskeeper, Philadelphia, Pa. App. filed March 31, 1909. Member with aperture in which a body of mercury is located, making contact with a conductor passing through the aperture.

1,099,091. ELECTRICAL TERMINAL DEVICE; W. G. Houskeeper, Philadelphia, Pa. App. filed Nov. 3, 1909. Reservoir with mercury which is suspended across an aperture by capillary attraction.

1,099,093. ELECTRIC CONTACT DEVICE; A. A. Kent, Philadelphia, Pa. App. filed Dec. 7, 1908. Ignition make-and-break in which both contacts are moved.

1,099,095. PROCESS OF PREPARING CONDUCTING FILAMENTS; H. D. Madden, Bloomfield, N. J., and W. G. Houskeeper, Philadelphia, Pa. App. filed March 31, 1909. Applies different amounts of current to different portions of the filament.

1,099,113. METHOD OF PRODUCING FIREPROOF MATERIALS FROM QUARTZ AND THE LIKE; W. Boehm, Berlin, Germany. App. filed Oct. 30, 1913. Treats zirconia to render it electrically conductive and then heats to melting temperature by passing current therethrough.

1,099,125. ELECTRIC HEATER; W. S. Hadaway, Jr., New Rochelle, N. Y. App. filed Feb. 20, 1913. For matrix-drying press; has liquid-containing tubes.

1,099,131. REFRACTORY LINING FOR FURNACES; O. Serpek, Paris, France. App. filed Jan. 26, 1911. Consists essentially of aluminum nitride with carbon and aluminous material.

1,099,138. SOLID TITANIUM-CARBIDE STICK ELECTRODE; W. G. Abbott, Jr., Lynn, Mass. App. filed June 1, 1910. Titanium-carbide particles cemented together by titanium sub-oxide.

13,742 (reissue). AUTOMATIC TELEPHONE EXCHANGE SYSTEM; J. W. Lattig, Glenside, Pa., and C. L. Goodrum, Urbana, Ohio. App. filed June 29, 1909. Original patent No. 920,350, May 4, 1909. Centralized battery, two differently wound selective relays and a neutral restoring relay.